AMERICAN MACHINIST

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ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

The "Stockport" Gas Engine.

In this engine, a perspective view of which we present, the piston receives an impulse at every revolution of the crank, the same as in a single-acting steam engine; this should insure regular turning with a fly-wheel of moderate proportions, and adapt the engine for use in electric light plants where moderate power is required, and for other purposes where regular speed is a requisite. In many respects this engine presents novel features, and in none more than in its simplicity of construction, and consequent small liability to derangement.

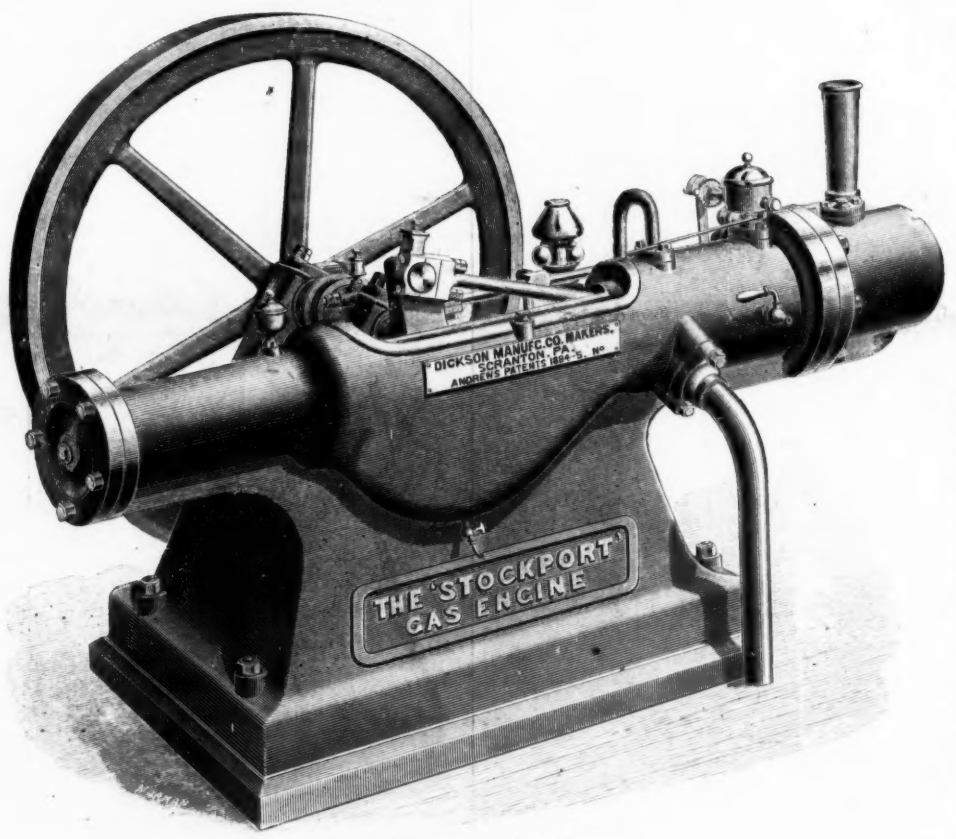
As will be noticed two cylinders are employed, set in line one with the other, and at opposite ends of the bed-plate. One of these is the power cylinder, in which the charge is exploded; in the other, which may be called the mixing cylinder, the explosive charge is drawn in at every revolution of the crank. The pistons of these two cylinders are rigidly connected by a trunk, so that their motion is simultaneous in all respects; the trunk is cut away between the two pistons, to provide room for the vibration of the connecting-rod. What may be termed the cross-head pin is situated in the trunk near the power piston, the other end of the connecting-rod taking hold of an over-hung crank pin in the ordinary manner.

In operation the mixing cylinder draws in a charge of air and gas during its motion in one direction, and in its motion in the other direction compresses and forces it forward through a passage provided in the bed, when at the proper time it is admitted to the power cylinder, further compressed and exploded.

The valve of the power cylinder is worked by a simple eccentric motion from the crank shaft; from a point about midway of the length of the eccentric rod attachment is made for operating the valve controlling the admission of air and gas in the mixing cylinder. The construction of this valve is such that the air and gas, in entering, are divided in a way to mix them; this admixture is made still more intimate in the passage back to the mixing cylinder, in that cylinder and in the passage forward to the power cylinder. Special pains have been taken to make all passages around the power cylinder and valve as direct as possible, so as to leave no points for the lodgment of dirt and gum.

The speed is controlled by means of a small fly-ball governor neatly encased.

The engine is of a very neat design, is compact, of few parts, and comparatively of light weight for a given power. It is very easily started, a charge being always in readiness so that a partial revolution of the fly-wheel will ignite it, and give the piston the required impulse. It is of English origin, its manufacture and sale in this country being exclusively in the hands of the Dickson Manufacturing Company, Scranton, Pa., and 112 Liberty street, New York. Regular sizes are from one to ten-horse power; all working parts are made to templates, and arranged by numbers so that duplicates can be ordered by telegraph and furnished by first express.



THE "STOCKPORT" GAS ENGINE.

Steel Castings on Locomotives.

The report of a committee of the Master Mechanics' Association, together with the discussion thereon at the recent annual convention in Washington, were published in our issues of July 4 and July 11. The subject has attracted a great deal of attention, and there has been a demand for still further information. We wrote to several manufacturers of steel castings, and from them obtained references to quite a number of railroads using them on locomotives. The Chester Steel Castings Company inform us that some 40,000 of their crank shafts are in use, and that they wear smoother and require less oil than other cranks, adding that "this should be the case with locomotive crossheads, if run in proper guides." We inquired of superintendents of motive power and master mechanics, references to whom were made by the manufacturers of steel castings, about their strength, comparative cost and wearing qualities. We present below a number of answers, which convey a great deal of valuable information, and hereby extend our thanks to the writers for their generosity in furnishing the same for the benefit of the mechanical public.

CHICAGO AND NORTH-WESTERN RAILROAD.

Answering yours of the 21st, in regard to the use of steel castings, will say I am and have been using them for a number of years in locomotive work and other machinery largely in place of cast iron, and also to take the place of many irregular shafts of wrought iron, and with excellent results. For locomotive work I use them entirely for crossheads, largely for rocker arms and many other parts where I formerly used cast iron. While the cost of steel castings is four or five times as much as that of cast iron, yet I consider the factors of safety and durability more than compensate for the increased cost. In many places where I have substituted steel castings for forgings of irregular shapes, they do not cost as much, with equally as good results.

G. W. TILTON,
Supt. Motive Power and Machinery.

CHICAGO, MILWAUKEE AND ST. PAUL RAILROAD.

In response to your favor of the 21st ult., which came to hand in my absence, I desire to say that we are using cast-steel castings for locomotive work of various kinds, principally for crossheads and levers.

With reference to the tensile strength, we some time since went into experiments in regard to the matter, and demonstrated that cast steel stood a tensile strain to the square inch of 86,000 pounds; Ulster iron, a tensile strain of 60,000 pounds; and common wrought iron, a tensile strain of 40,000 pounds.

The elongation of the latter was $\frac{1}{4}$ inch, of the Ulster iron $\frac{1}{2}$ inch, and of the steel $\frac{1}{8}\frac{1}{8}$ inch, when they broke. In point of cost, except for large castings, such as crossheads, there is no economy in cheapness over forged work further than that castings made accurately to patterns require less fitting. I should have said that the cast steel referred to that was tested, was made by the Solid Steel Company, of Alliance, Ohio. You will observe that it shows a remarkable strength.

J. M. LOWRY,
General Master Mechanic.

LOUISVILLE, NEW ALBANY AND CHICAGO RAILROAD.

We have ten engines with cast steel crossheads that have been in service nearly five years, and eight more that have been in service less than four years. The cast-steel crossheads have given entire satisfaction; in fact, none have given out, and all of them are apparently as good as when first put into service. My experience with steel castings has been highly favorable. I have not used many steel castings with wearing services, nor am I familiar with the cost, but the comparative strength is very much in favor of the steel over iron castings.

J. BETTIS,
Master Mechanic.

PENNSYLVANIA RAILROAD.

We have only used steel castings to a limited extent in our locomotive work, principally driving boxes in engines, where the spring rigging is suspended from the lower part of the box.

So far as I am aware, these castings answer the purpose very well, so far as strength and wearing qualities are concerned. Their cost is, however, somewhat greater than the iron castings.

THEO. N. ELY,
General Supt. Motive Power.

CHICAGO, ROCK ISLAND AND PACIFIC RAILROAD.

I have successfully used cast-steel cross-heads and rockers for several years, and am about to try steel link hangers and driving boxes. We have had one set of steel driving boxes on an engine for about a year, and have heard no complaint, but wish to wait until we see what long wearing will do.

My experience is that steel castings may be used successfully as a substitute for cast iron wherever unusual strength is required, and in many places where difficult and expensive forgings are used. I have been unable, however, to make cast steel wear against wrought iron or steel, but against cast iron or brass it is all right. On crossheads I use brass or phosphor-bronze gibs. In regard to cost, I can give you no positive figures, but the saving over a difficult forging, as in the case of a rocker, is very considerable, and, as to strength, the steel crosshead is very valuable, as greater strength is obtained without an increase of weight.

THOS. B. TWOMBLY,
General Master Mechanic.

BOSTON AND ALBANY RAILROAD.

We are using steel castings in place of wrought forgings and iron castings. We do this for both economy and strength. Our driving boxes and crossheads we make of steel, because we need the strength. Link lifters and other small work we make of steel, because they are cheaper than wrought forgings. All the wearing surfaces we protect, otherwise trouble from cutting soon takes place. What the comparative difference in strength and economy is I do not know, and I doubt if any one does.

A. B. UNDERHILL,
Supt. Motive Power.

NEW YORK, PENNSYLVANIA AND OHIO RAILROAD.

In the past four years we have built and rebuilt 140 locomotives, and have equipped them all with cast-steel crossheads, in place of cast iron, at a cost of six cents per pound, as against two cents per pound for cast iron

The cost of fitting up is about the same, and we have never had one of these castings give out or show any indications of failure. I consider them nearly equal to wrought iron in strength when they are properly annealed, and consider them indispensable in locomotive building. It is impossible to make a cast-iron crosshead that will stand the large cylinder and high pressure of steam used on locomotives at the present time, and I think the day is not far distant when the pistons and driving boxes will be made of steel castings, in place of cast iron.

Wm. Fuller,
Supt. Motive Power.

MILWAUKEE AND NORTHERN RAILROAD.

The only use I have made of steel castings has been for crossheads, and for that purpose I consider it preferable to any other on account of its extra strength. Have never had a broken steel crosshead, while of cast iron have had several, the disastrous consequences of which render first cost comparisons very insignificant.

N. S. Kimball,
Master Mechanic.

NEW YORK, SUSQUEHANNA AND WESTERN RAILROAD.

I have had no experience, not having used steel castings. I have in use a few crossheads made from charcoal iron and a mixture of 20 per cent. of a very low grade steel, so far with satisfactory results. After one year's service, I cannot see that it wears any better than good close cast iron, but certainly is stronger.

W. C. Ennis,
Master Mechanic.

TERRE HAUTE AND INDIANAPOLIS RAILROAD (VANDALIA LINE).

We have had but little experience with steel castings on locomotives, except for crossheads and rocker arms. Steel crossheads work well, except when used with steel guides, in which case there is great liability of cutting. Cast-steel rockers give good satisfaction. Cast steel is preferable for all work requiring to be light and strong, and not subject to excessive friction in contact with steel. The first cost is about as three to one, but we think the steel is cheaper in the end.

G. H. Prescott,
Supt. Motive Power and Machinery.

GRAND TRUNK RAILWAY OF CANADA.

I am sorry that I am not able to give you anything beyond a general idea of our work, as up to the present time we have used steel castings only experimentally.

Quite a number of the locomotives of this company, however, are running with cast-steel crossheads and axle boxes, the tenders of passenger engines being equipped also with the Miller coupler in the same material. All these have given satisfaction, and I am continuing their use.

I have tried valve spindles and connecting-rods in cases where lateral strength was required, making them of the channel or fluted form, but found it difficult to get the castings perfect.

In this country, where the facilities for the manufacture of steel castings are so limited and the time taken to import so long, I have found that the use of cast iron saves a great deal of time and trouble, which is, perhaps, one of the reasons why steel castings have not been more extensively used, or that consideration given to them which they undoubtedly deserve.

Herbert Wallis,
Mechanical Supt.

BURLINGTON AND LAMOILLE RAILROAD.

I must say that I have had but very little experience with steel castings for locomotives, having only a few eccentrics made of cast-steel casting, which run very nicely, but I think the straps wear low much faster than the common cast-iron eccentrics with cast-iron strap.

I have most all of our passenger cars equipped with cast-steel Miller hooks, instead of the common wrought top and bottom and cast-iron center. In regard to the services, all that I can say is, I have been using them about three years running some of the cars on mixed trains, coupling on to old freight draw bars with link and pin. And I don't think bars show any wear, while with the wrought hook in that service it was all the time repairing.

With what little experience I have had, I think we have saved a large amount of money by using the cast steel so far. I wish I was able at the present time to give you more information on the subject, but hope later to be able to do so.

F. G. Brownell,
Master Mechanic.

RICHMOND AND DANVILLE RAILROAD.

We have had no experience with true steel castings, and have used the "Chester steel" to a very limited extent—mostly for rocker arms.

For this purpose, it answers very well, and is, we think, cheaper than forgings.

We understand that for slides steel wears very badly, and, if we do conclude to try it, we will probably tin the surface.

When our cast-iron crossheads will not wear properly, we flux the surface and cast tin upon it, and then plane to size.

This wears admirably, provided the joint is good and the tin not too think. About $\frac{1}{16}''$ gives good results.

Your other questions as to strength and cost we are unable to answer.

R. D. Wade,
Supt. Motive Power.

LAKE SHORE AND MICHIGAN SOUTHERN RAILROAD

Our experience with steel castings is confined chiefly to steel castings for crossheads; and, while we have no data as to comparison of wear, the breakages are none compared with cast iron for the same purpose. We are using to a limited extent cast-steel rocker arms, and hope soon to be able to give comparison as to wear. The strength of steel castings would range about two and a half times stronger than cast iron, and one and a half times stronger than wrought.

G. W. Stevens,
Supt. Motive Power.

MICHIGAN CENTRAL RAILROAD.

Regarding the use of steel castings upon locomotives, I would say that my experience has been so limited that I do not feel like venturing an opinion as to its comparative strength, cost and wearing qualities.

We have but very few steel castings in use upon our locomotives, and the few we have got have been in use so short a time that, as above stated, I would hardly feel warranted in giving an opinion regarding them.

With more experience in this matter, I would be pleased to comply with your request, and at any time to furnish you with any information of the above nature that I may be able to.

C. E. Smart,
General Master Mechanic.

KANSAS CITY, FORT SCOTT AND GULF RAILROAD.

I have been using cast-steel castings for locomotive crossheads for several years, and have had good results. I use cast-iron gibs in them, babbitted, as the steel castings on steel slides do not run satisfactorily. I have no data giving relative cost of steel and cast iron. Have not used steel castings for any other parts of the locomotive.

J. S. McCrum,
Master Mechanic.

DELAWARE, LACKAWANNA AND WESTERN RAILROAD.

The only use I have made of steel castings is in locomotive crossheads, for which service it appears to be well suited, being so much stronger than cast iron, and takes the place of wrought iron at about half the cost. It is not a good wearing metal. In contact with wrought iron or steel guide bars, have a disposition to cut; therefore, we use gibs of either cast iron and babbitt metal or bronze, and wrist pins of forged steel. I have made no tests of the strength of steel castings.

Walter Dawson,
Master Mechanic.

NEW YORK, LAKE ERIE AND WESTERN RAILROAD.

In reference to strength of steel castings for locomotive work, would say that I have not had time to work up any special data in reference to these castings, but we have them in use on many parts of our locomotives, and are extending the use of them. If they continue to give equally good results, I think they will largely supersede cast iron for many purposes. The great drawback to steel castings appears to be in the difficulty to get them solid, being very much more liable to be filled with blow holes.

F. M. Hilder,
Supt. Motive Power.

ILLINOIS CENTRAL RAILROAD.

I am sorry that I cannot give you the information asked for, as we never went into steel castings for different parts of the locomotive very extensively.

We are now trying castings from different makers of rocker arms and crossheads, but we have not used them long enough to give an opinion.

H. Schlacks,
Supt. Machinery.

PASSUMPSIC RAILROAD.

Yours of the 21st inst., in reference to steel castings for locomotive work, to hand and noted. In reply, will say my experience in regard to them is somewhat limited, but, so far as I know I am very much in favor of them, both for durability and cheapness.

L. L. Brigham,
Master Mechanic.

CONNECTICUT RIVER RAILROAD.

We have a few steel driving boxes in use, but have not been using them long enough for me to give you the information you desire, as we have not been able as yet to give them a proper test.

W. H. Stearns,
Master Mechanic.

GREEN BAY, WINONA AND ST. PAUL RAILROAD.

I cannot say much about steel castings, as I have only been using them about two months. I put in some crossheads with brass gibs, and they seem to do well so far. I intend to use more steel castings in future, as I think they are good and much cheaper than forgings. I will be pleased to give you any information I can after using them a while longer.

A. Fenwick,
Master Mechanic.

BOSTON AND PROVIDENCE RAILROAD.

We have used steel castings to some extent on locomotives, because we wanted a stronger material than cast iron, and in the steel we found it. I cannot say as to wearing qualities.

Geo. Richards,
Master Mechanic.

CINCINNATI, WASHINGTON AND BALTIMORE RAILROAD.

We use steel castings on our locomotives in the rockers only. I have since December, 1882, applied thirteen pairs, at a comparative cost of about one-half that of wrought iron. They have, thus far, required no repairs, are now in first-class condition, with no perceptible wear, and give perfect and entire satisfaction.

Edward Evans,
Master Mechanic.

BUFFALO, NEW YORK AND PHILADELPHIA RAILROAD.

We have not used any steel castings for locomotive work so far, except for crossheads, which have given entire satisfaction.

A. Vail,
Master Mechanic.

CHICAGO AND EASTERN ILLINOIS RAILROAD.

We have quite a number of steel crossheads in service, and although the first cost is rather high, we are very well pleased with them as they are lighter, stronger and more durable than cast iron.

Allen Cooke,
Master Mechanic.

We learn from the Northern Pacific, the Union Pacific, and several other railroads, that they are using steel castings on locomotives, but that their experience is not yet large enough to give information of value regarding them. We hope to hear from other railroads that have had experience with them. The development of special information will benefit both the railroads and the manufacturers who are in the business of supplying them. As President Barnett said, in his opening address at the recent annual convention of the Master Mechanics' Association, when the master mechanics can more definitely define what they want, manufacturers will be better enabled to supply their requirements. Regarding this point, the following letter from a manufacturer of steel castings doubtless represents the general views of all those who supply railroads with that class of material:

Editor American Machinist:

The published report in your issue of July 11th of the discussion of railway master mechanics, regarding the wearing qualities of cast-steel crossheads, will doubtless lead to the production of a quality of steel in them which will give the desired service. In our open-hearth practice, it is possible to vary the composition of the metal from material soft as Norway iron to that so hard as to resist the attack of a file. Recently, a specimen of a steel rail which had done remarkable service on the line of the Pennsylvania Company's road was sent to the assistant chemist of the Edgar Thompson Steel Works for analysis. This rail, which had perfectly withstood the wear of severe service, was found to be of a certain chemical composition which can doubtless be reproduced for locomotive crossheads, which would do the service desired. Now that our friends, the master mechanics, have stated wherein steel crossheads should be improved, they will not long be kept waiting for desired results.

Wm. P. Darling,
The Buffalo Steel Foundry,
Buffalo, N. Y.

Light Machinery with Abundant Paint.

A correspondent of the American Machinist who is now in London in the interest of some machinery manufacturers on this side of the Atlantic, writes us: "There seems to be a prejudice against United States machinery here on account of its lightness and abundance of paint." If Englishmen want heavy machinery they can get it in this country just as readily as light machinery. We suspect that English dealers in American machinery import the light stuff because it is cheaper. But what looks light to an Englishman, accustomed to using the clumsy and abnormally heavy machinery they make in that country, may be heavy enough to do its work properly. Wherever American machinery has been used in Europe, it has been satisfactory enough to lead to imitations—not however as good as the originals. This is about as positive a compliment as could be given. The paint complained of must be upon agricultural machinery. There is not paint enough upon American shop machinery to offend the most fastidious Englishman that squints at objects through a single eye-glass. If agricultural implements are heavily painted a deep cerrulean blue or a fiery red it is because Uncle Hayseed, as Prof. Sweet says, will buy them a great deal sooner than he would if destitute of brilliant paint. Americans, as a rule, adapt their productions to the probable purchasers.

A Miter Gear should never have less than twenty teeth, and thirty is the best number for general use. A good rule for bevel gears, that will serve most purposes, is that the sum of the teeth of the pair should be sixty.—*John J. Grant.*

Moulding Hammer Dies.

BY ROBERT E. MASTERS.

One of the old plans of moulding steam hammer dies was to have that part of the pattern which was moulded in the cope in one solid piece. Having to draft this so that it would draw out of the cope after it was lifted off left considerable work for the machinist to plane it out, so that it would fit the dovetail in the stem of the hammer.

Another plan, to save work in the machine shop, was to have the dovetail in the upper half of the pattern made so that it would leave only a margin for the machinist to dress up. In this pattern, the upper part was one solid piece also, a flask of three parts being necessary to mould the hammer die, the cope being lifted off at the extreme upper part of the pattern, the dovetail portion drawn out of the cheek, then the cheek lifted off down to the shoulder of the main portion of the pattern, to allow that part to be drawn out of the drag.

The sectional views, Figs. 1 and 2, show the manner in which they are made at present in some foundries engaged on this class of work, and employed to advantage for the last few years by the writer in moulding heavy and light hammer dies, saving time and labor in both the foundry and machine shop.

The lower part of the pattern *A*, in Fig. 1, is rammed up in the drag, and turned over or bedded in the floor, whichever method is preferred. Moulding in flasks has the advantage in point of time, but where the work is extra heavy, bedding in the floor is the safest.

The upper part of the pattern is in two parts, lengthwise and dovetailed together as at *B*, the dovetails being on the narrow piece *C*, near each end and the recesses in piece *D*; both of these pieces have dowel-pins to fit into part *A*.

Fig. 2 will show the cope after it has been lifted off and turned around to present the same view. The piece *D* is now drawn out of the mould, *C* is rapped loose and moved back so as to clear the sand, and drawn out, then turned end for end, and put back in the other side of the mould, as shown by dotted lines at *E*, after filling the space *F* with sand and securing it so that it will not drop off or be washed up by the pressure of the iron.

The piece is rapped and moved back enough to clear the shoulder, and drawn out the same as on the other side. From *G* to *G*, in Fig. 1, will show the shape of the mould after the space *F* has been filled and the mould closed.

It will be noticed that the spaces from the shoulder of the hammer into the crotch of the dovetail above *H*, *H*, are not equal. This is occasioned by the dovetail which fits into the stem of the hammer being diagonally across *A*.

Hammer dies made on this plan require but very little, if any, finishing to fit them into their place, and are moulded much quicker than those made in a flask of three parts.

One of the most essential points in making hammer dies is in the mixture of the metals that they are to be made of, so that they will give good service, and not batter out of shape in a short time. Various kinds of mixtures have been used; chilling the face of the hammer die has been resorted to; making the face of steel, with a dovetail in it, and setting it in the mould and pouring the cast iron in on top has been practiced, but neither of these plans has given the desired results, *i. e.*, a good, serviceable cast die.

In correspondence with Mr. David Spence, foundry foreman for Geo. W. Brown & Co., Galesburg, Ill., I mentioned that I would shortly write an article on moulding hammer dies. In reply he gave me a process he employed of mixing and melting his metals to produce a steel-face hammer die, which, to me, was a new idea. He was kind enough to add that I could use it in connection with my article for the benefit of the readers of the AMERICAN MACHINIST. I cannot do better than to present it in Mr. Spence's own language:

"When I came here they used to make the face of the dies of steel, and put a dovetail in it, setting that in the mould and then casting the iron on it; but that would not stand any time, and casting it would take the temper out of the steel. I make a mixture for the face of the dies out of cast and wrought iron (I do not use any scrap steel), melting it in a crucible in an ordinary brass furnace. The way I melt is: I weigh up 100 lbs. of Appleton (charcoal) iron, then weigh out 25 lbs. of wrought iron, and then put in the crucible together, mixing about one pint of borax with it. It melts in about two hours and a-half from the time it is charged in the crucible; our brass furnace is an old one. I am now making furnace fixtures for new brass furnace, so that I can melt larger quantities in better time.

"I have my steel melted and ready to pour about the same time of the day that we cast. I catch my cast iron and set it down; I then take out my steel and pour it first, and just as soon as I am done pouring the steel I fill the rest of the mould with cast iron. The largest dies I cast are about 125 lbs. weight. I pour about 40 lbs. of the melted steel into the mould, through a separate gate, and after I am done pouring the steel I pour the cast iron in through another sprew or gate; all the time I allow between pouring the steel and the cast iron is that occupied in setting the crucible down and picking up the ladle of cast iron. As the steel is the heaviest metal it remains at the bottom of the mould; the iron does not mix with it more than enough to form a good union of the metals, and not enough to hurt the face of the die, consequently I produce a hammer die, the face of which is very strong and tough and gives better service than any we have yet used. I send you by mail a sample of the steel."

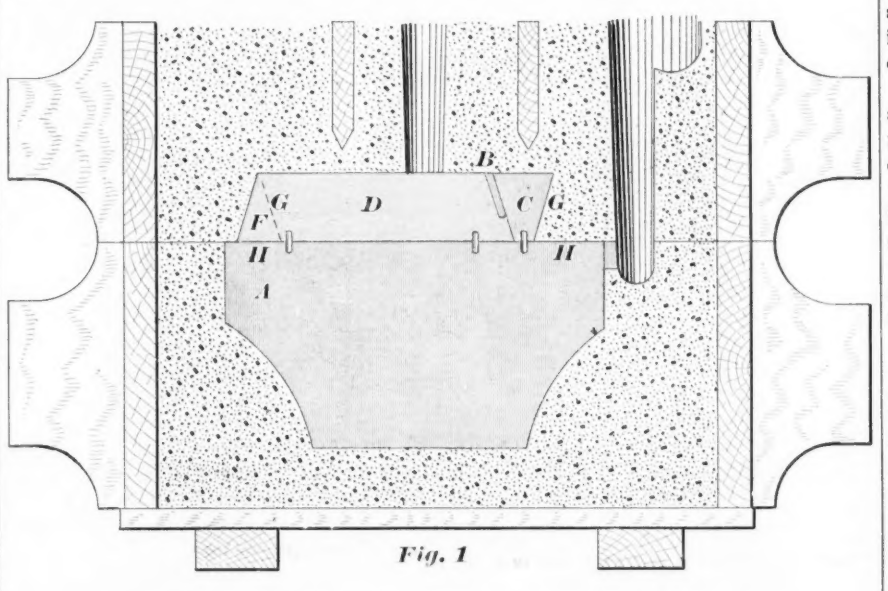


Fig. 1

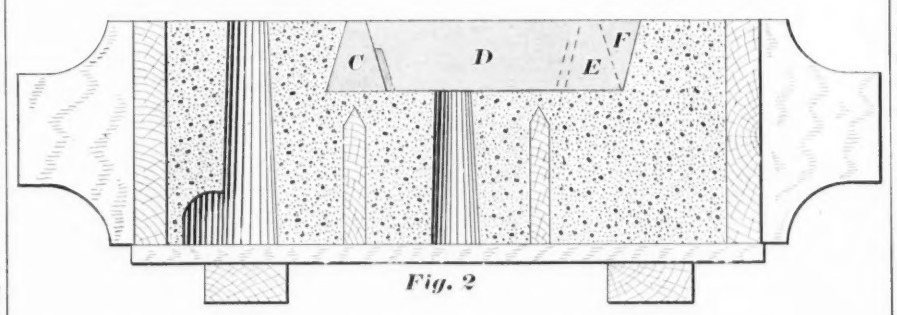


Fig. 2

The sample sent me by Mr. Spence shows a mild steel which I have found on submitting to a test to be as he states "strong and tough."

It is strange how unreasonable some employers are; they never seem to consult the intellectual longings of their employes. Here is a Western boiler-maker who has just contemptuously refused to have a reader read aloud to his men while they are at work, although he was assured that men work much faster when their minds are employed.—*Manufacturers' Gazette.*

As a boiler shop in full operation is a first rate place to listen to good reading it is hoped that the owner of that shop will reconsider his decision. The benefits of listening to a good story or poem while riveting a boiler, are not to be lightly thrust aside.

There appears to be somewhat extraordinary efforts this year on the part of many towns not yet risen to the dignity of cities to provide themselves with water-works. Such movements are generally wise and far-sighted. Money judiciously expended in this direction is nearly always well invested. As towns get to be thickly populated, wells almost invariably become contaminated, and in a manner so gradual as not to attract notice, until, perhaps, some epidemic breaks out and provokes investigation. But, aside from sanitary considerations, there are other reasons that make it advisable for growing towns to provide early for generous water supply. Not the least of these is the inducement which such provision offers to manufacturers to locate. Most manufacturing enterprises require the use of considerable quantities of water for their prosecution, and facilities for extinguishing fires in such establishments are important. Manufacturers take kindly to a town well supplied with water, and are little likely to consider locating where there is a scarcity of it. More than one town or city noted for its manufacturing interests can trace the beginning of its growth to the establishment of water-works.

Last week we copied a table of the average weekly wages in 58 mechanical occupations in Pennsylvania from the recent report of the Chief of the Bureau of Industrial Statistics. It was compiled by taking the whole number employed in each industry and the whole amount of wages paid as a basis for striking the average paid to each workman. The best average is paid to the makers of crucibles, $16 60 a week. But it is a very limited industry. The next highest average is paid to workmen in Bessemer steel works, $12 17 a week. There are several thousand men employed in this industry in Pennsylvania. It has been a favorite pastime for free-trade newspapers to expatiate upon the very low wages paid in protected industries, singling out Bessemer steel manufacture as one of the most conspicuous. As usual when the facts come to be known, these arguments have nothing to rest upon. All American industries are benefited by protection (except the importing business), some directly and many indirectly. It should be noted that both skilled and unskilled workmen are counted in making above averages of weekly wages.

The Secretary of the American Society of Mechanical Engineers, Mr. F. R. Hutton, 280 Broadway, New York, sends a circular to members (who now number over 500) announcing that arrangements are under way to hold the annual meeting in the city of Boston early in the month of November next. The exact date, however, has not been fixed. All previous annual meetings have been held in New York. The circular says:

"Titles of papers and queries for the topical discussions at this coming meeting should be sent to the Secretary's office as early as possible. Members are reminded of the ruling of the council that illustrated papers should be in the Secretary's hands at least six weeks in advance of the meeting at which they are to be presented, while unillustrated papers may have a shorter interval. But in any case it favors more satisfactory presentation at the meetings the further in advance of the limit of time is the arrival of the MSS."

The Anti-Monopoly League of the State of New York, announces by circular that it will hold a convention in the city of Albany, Sept. 8. The circular declares that "the Anti-Monopoly League has been instrumental in placing on the statute books in this State laws establishing a Railroad Commission, a Bureau of Labor Statistics, and the constitional amendments making the canals free, and abolishing the system of contract labor in the prisons of the State, together with other remedial legislation."

It will be an interesting piece of news to all those who have tried to keep informed on public events in this State, to hear that a constitutional amendment has been adopted which abolishes the system of contract labor in the prisons. The people have never had a chance to vote for such an amendment. When they do have the chance, it will be adopted by such a majority that it will make the contractors and their touters feel seasick.

Professors of understanding of wine are always saying of American wine that it lacks body. Recent statistics from Washington show that it has body at least in one sense—that of volume. From 1877 to 1884, inclusive, there was an average annual production in this country of 18,964,459 gallons of wine, and in the same time there was an average annual importation of only 5,142,957 gallons. In 1840, foreign wine formed a little more than ninety-seven per cent. of all the wine consumed in the United States; since 1880 it has formed, making an annual average, only a little more than twenty-three per cent. In 1840 this country imported 4,748,362 gallons; in 1850, 6,094,622; in 1860, 9,199,133; in 1870, 9,165,549; and in 1880, 5,030,601. And yet since 1840 the total consumption of wine in the United States has increased 400 per cent.—*Harper's Weekly.*

It is not good for the public that one telegraph company should monopolize the whole telegraphic business of this country. The Western Union Company has practically had a monopoly, crushing out or buying up all competitors. But the Baltimore & Ohio Company seems to be a competitor that has come to stay. They refuse to be bought up or to enter into a combination with Gould, Field & Co. to advance rates to fleece the public. They seem to have abundant capital, and if they pursue the course they have declared the public will not only have telegraphic facilities at reasonable rates but will have messages delivered within a reasonable time, which is something the Western Union cannot be depended upon to do.

It is often a matter of considerable wonder to find the names of reputable engineers appended in the way of recommendation to an advertisement of something of very doubtful utility. How this may sometimes come about is, perhaps, explained by a recent occurrence in Galveston, Texas. In a case in the courts there counsel argued that no reliance could be placed upon petitions promiscuously signed, but his argument was not held as being good by the Court. To demonstrate its soundness he prepared a petition calling for the hanging of one of the most respectable citizens, and actually obtained to it the signatures of all the court officers and of sixty business men.

The Rice Sand-Moulding Machine.

We herewith present an illustration of this machine which is designed for making moulds for foundry use, where large quantities of castings are required. Its simplicity can be appreciated, as the cut shows all moving parts except the template or follower, which is described hereafter. The machine has new features of operation, one being the fact that the pattern does not move, but is firmly attached to the bed of the machine, and is stripped by the rising of the flask after the mould is made. This new method enables it to turn out with equal ease a large variety of castings, the greatest accuracy being assured as to a perfect match and equal weight of casting, by the fact that the pattern never moves, and the depth it goes into the sand is governed by the template or follower, which rests solidly on the bed of the machine.

The operation of the machine is described as follows: The movable box which supports the flask and binder has an up and down movement about the pattern and template. At the bottom of the down stroke, the template or follower is exactly on line with the bottom of the flask, the pattern extending above it into the sand. The pattern is stationary and immovable, being rigidly attached to the frame of the machine. The follower or template about the pattern rests firmly on the bed of the machine during compression, and after the mould is formed it rises with the flask, supporting the sand while it strips the pattern, then slowly separates from the sand just before the flask reaches the limit of the upward stroke. The cams shown inside the lower part of the machine, raise the template as described, the stroke made by the cam-rods and pitman being nearly equal. The arched binder at the top is thrown to one side to take off and replace the flask, the cover attached to it holding the sand in the flask during compression.

It operating the machine it stops automatically at the right distance above the limit of the down-stroke (usually about 1½ in.); this leaves the follower the same distance below the top of the movable box, filled with sand from the hopper behind the machine by an automatic movement of the sand drawer, and the binder secured in place. The machine being started by movement of the friction clutch lever, completes its down-stroke, bringing the follower on a line with the bottom of the flask, thus forcing the surplus sand into it. After the upward stroke is completed the flask containing the mould is removed and another flask put in place for repeating the operation. The compression takes place at the line where the box and flask join, the density of the sand being greatest at the pattern and face of flask, and gradually decreasing in density as it nears the back, giving perfect vent and obviating the necessity of using vent wires. The capacity of the machine varies from 30 to 60 finished flasks per hour, according to the facilities for removing the flasks.

These machines are manufactured by the Peerless Manufacturing Company, Louisville, Ky.

The *Railway Review* of London, says: "The progress made by co-operative societies in this country has during the past few years been most rapid, especially in the northern districts. For example, the Manchester district, according to the annual report for 1884, comprises 339,108 members, and the Newcastle district 95,994, while the London district shows a total of 61,891.

An agreement has been entered into between the Secretary of the Navy and the Assignees of John Roach whereby the unfinished cruisers Atlanta, Chicago, and Boston will be completed by the Navy Department under the agency of the assignees. The Roach shipyard will pass under control of the Government, who will pay the contract price for the vessels, but they will be completed through the agency of, and the material for them will be furnished by, the assignees.

That Left-Hand Thread — Locomotive Frames and Cutting Down Expenses—Rum and a Machinist.

By James F. Hobart.

"Look here, Mr. Hobart," said the foreman in the tool-room of a big locomotive manufactory, "how about that left-hand thread business? The boys are all 'getting on to you' about that bolt racket, and some of the papers are coming down on this, and about grinding on a gear with sand."

"They call them 'freaks in the principles of machines and fancy sketches.' Now, if there is anything true about those yarns, I wish you would tell me how the things were done."

It is all true, Mr. Tool-Maker. I never yet gave a fancy sketch in the American Machinist. The "scratched post" was true, as anybody can see by sending for a photo of it. The gear-grinding scrape occurred in the paper mill of J. B. Warren & Co., not fifty miles from Boston, and the left-hand screw business—well, Hobart did that trick himself, and did it accidentally and without malice aforethought. A steel bolt, $\frac{3}{8}'' \times 1''$, was wanted. I forged it in an old heading tool, and upset it in the vise, which was a trifle large. When I went to cut the thread, I found the bolt about $\frac{7}{16}''$ in diameter. The only set of sixteen dies in the shop were forty years old, of the sqush pattern. The bolt being large, it only touched at the corners of the dies, or in four places. The thread on said bolt was to be cut clear up to the head. I slipped the plate on to the middle of the bolt, tightened up the screw, while giving the plate two or three short turns back and forth to work the dies into the bolt as I tightened up the set screw. A little oil was put on top of the bolt to run down between the dies, and I began to turn the plate down toward the head of the bolt, or *right-handed*.

Naturally enough, all this was done mechanically, and I was thinking of other parts of the job, which was to be a boat lock which the boys could not pick or blow up with gunpowder.

After five or six turns of the die-plate, I looked to see if the plate was not about down to the head. Instead of that, it was within $\frac{1}{4}''$ of the top of the bolt. "What's this?" I thought, stooping down and looking under the plate. I saw that it was cutting a thread, and out of curiosity kept on turning until the plate came off the end of the bolt. What was it? It was as pretty a 32-pitch, left-hand thread as was ever cut by a "sqush die." Thirty-two threads to the inch, slick and clean, single-thread, and nothing scored or stumped about it. I looked at the dies. They were loose and "shackly" in the stock. *One* of them was in, bottom side up.

I forged another bolt as near like the first as possible. It was cut as the first, and out came a good beginning for a right-hand 16-thread.

The original bolt is somewhere among my effects, which are at present divided between two cities and a country town. I am looking for that bolt, and the day I get hold of it it starts immediately for the office of the American Machinist.

A big railroad repair shop has got an upright slotting machine. A locomotive frame is placed on a cob-house of blocks. One end of the frame rests on the table of the slotting machine, and is bolted thereto.

After finishing up a piece of that frame, it is unbolted, raised up by the chain falls, slid along until a new place is reached, and then leveled, squared, bolted, and the cutting ceremony repeated. That shop needs one man and nine days' time to slot a frame. Hinklotive has rigged his shop for such work. We can send a frame up there this morning and get it back again to-morrow evening, all done in good shape. It was bolted to the big table of a triple slotting machine, and was never moved until finished. Our job was shifted fifty times. Hinklotive's job was true and square; ours was "? ? ?." We do this thing right along. Why? Nine days against one day! Our road has cut down expenses (?) in every conceivable way. They have figured everything down fine. Wages are down to hard pan. They are not doing any new work, yet why is this done?

It is done to tickle the stockholders; that's just why. Here is a repair shop that is running all the time. It is expected to run. We can discharge 100 men at any time when the stockholders and directors feel a little economical. We can discharge them to-day and hire them again to-morrow, and everything is lovely, but let us show a bill from Hinklotive, reading: "To slotting 2 locomotive frames, $12," and we get into hot water and hot brimstone right off. Such expenditures must be cut down. They are extravagant; so we are forced to do the job on our own little slotter, and let it cost $54!

There is rottenness in this business. When Ezra and Sampson are set to overhauling and rebuilding twelve ratchet drill-stocks, there is more rottenness in the business. Ezra and Sampson worked two weeks on twelve drills. They used up some good vise steel and a good lot of the blacksmith's time. They rebuilt those drill stocks thoroughly. When done, they were not quite as good as new. Ezra gets $2 25 per day, and Sampson gets $2 50. Twelve days, at $4.75 per day. Just $57. We bought some new drills the other day. They cost us $30 per dozen. The drill-stocks Ezra and Sampson overhauled cost $30 when they were new.

Query: Who saved that $27.50? Verily, we must make a reduction in cost of repairs and round-house work. We must "reduce the force of mechanics, or curtail the hours of labor, or both." We have not yet decided which.

John had a good job in a paper-mill repair shop. He got $3 per day, not much Sunday work, and got "time and a half" for overwork. John had a pretty wife, and thought a great deal of her, as he should. John had been quite a wild boy before he got married, and used to "work the growler" considerably.

John and Mary had gone to housekeeping in a small way. They were buying "household gods" one by one, and had both got well clothed up. They were getting along finely and everything was lovely, until one night Mary said: "O, John! I wish we had a glass of lager beer. Go out and get one, will you?" John hesitated. He knew his old weak point, and Mary knew it too, but she did not think. She said again: "I wish you would, John." John said no more. He thought "a little lager is nothing;" so he went out and got three bottles. They drank a bottle and sat down to a quiet game of dominoes.

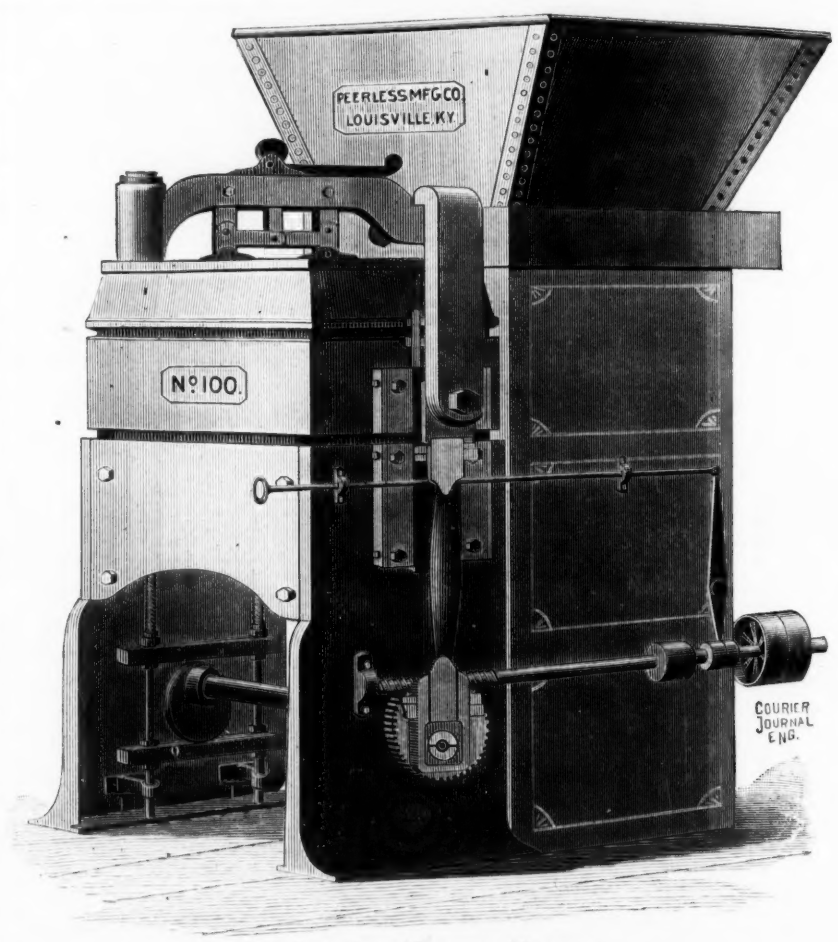
The job was done. In half an hour, John was crazy for drink. The other two bottles were emptied, and only seemed to aggravate his thirst. He went out, in spite of Mary's protestations, and in two hours he was beastly drunk. It was four days before he showed up at home. Mary went out to look for John. She met a friend (?) who induced her to go home with her and take a glass of wine to "keep up her spirits." She took two glasses of wine and her friend went with her to find John. They went into several places where the friend was acquainted, and more wine was drank. Mary's money gave out and the pawnshop got her nice black dress.

John got out of money while Mary was out. He went home drunk and half crazy. "Mary will help me stay in" he thought as he stumbled along. No Mary—the house was empty, and sick at heart and wild for more drink, John caught up his good overcoat, rushed out, and pawned it. They were both on a terrible spree. His appetite had overcome him, and Mary had been driven crazy by a single taste. Her love for it was inherited, and a single glass lighted the fire.

In two weeks that happy little home was empty. John and Mary had met but once during that time. Then, neither spoke to the other; they were both eagerly snatching up their household treasures to pawn for rum. One morning they met again. This time it was in the police court. Both were held to answer for charges of drunkenness. A friend interviewed the judge, and John and Mary, with averted eyes and hanging heads, walked away together.

They went to boarding. We talked with John's boss, and he went back to work. The next Sunday he was drunk again. His job was lost to him forever. He left the city, his wife went with him. We have heard but once from him for four years. He may be dragging out a miserable existence, cursed by rum and loathed by men, but we hope he has quit forever the rum drinker's habits. He may read these lines and recognize the hand that penned them. We hope he will, and add his testimony.

Here was a happy home wrecked by a heedless wish. How easy would it have been to have averted the whole trouble if either had "only thought." There are many Johns and



The Rice Sand-Moulding Machine.

Marys in our wide world, and may they all realize the woe and misery which a thoughtless wish may bring to them. There is just one way to do when we are tempted: Say *No, and stick to it.*

Let us beware, when we ask a man to "go and have a glass of beer." Perhaps we note the start, a flush and a sudden paleness as he feebly says "No." Don't urge that man. He is trying to conquer the worst devil that ever men fought. Don't tempt him. If you cannot offer him any encouragement in his heroic undertaking, at least let him alone, and do not add fuel to the fire he is trying to extinguish.

Compound Locomotives.

A correspondent of the *English Mechanic* has this to say of the compound locomotives on the North-Western Railway:

These, as you are well aware, were designed chiefly with the view of reducing fuel consumption. There are two classes of compounds, the small or "Experiment" class, working with 150 lbs. pressure, and the big or "Dreadnaught" class, working with 175 lbs., and weighing over 40 tons. Both classes, however, really work at pressures considerably higher than the nominal figures, which is to be borne in mind in considering the results yielded.

One fact in reference to the compounds admits of no contradiction—they are unable to attain the highest speeds. Up to about 50 miles an hour they are well enough, but back pressure in the big cylinder, stiffness of working, or some other cause prevents the proper running of the engine when this rate is exceeded. However great the emergency, a compound cannot exceed its normal pace down-hill, and thus it happens that if by any mischance time is lost up-hill, the train has to come in late, for time cannot be made up down-hill. With some of the fastest trains it is all but impossible for the compounds—small ones at any rate—to keep time. No compound yet has ever kept time with the 10.10 between Bletchley and Rugby, or is likely to. I much doubt if they could manage the 12 noon, Euston to Rugby. The facts relating to the speed power of the compounds are more than even sophistry can distort; and whilst, therefore, the number which have been built is cause of astonishment, it is merely another instance of the pertinacity of engineers.

Next to time lost in running, comes time wasted in starting. Sometimes compounds have not merely delayed, but have absolutely refused to start at all until assisted by another engine. With heavy trains half a minute to a minute is often lost on starts, especially if the gradient is unfavorable. Of course, other engines do so, too, sometimes, but not to the extent the compounds do.

It is not easy to get at the coal consumption, but inquiries tend to show that drivers receive no more coal premiums than formerly, if as much. I am induced to believe that no coal really is saved, a view which is supported by the trial on the South-Western. If report is correct, the number of failures with compounds is abnormally high and general repairs expensive. The oil required for lubricating purposes is also very considerable.

There may be amongst your numerous readers some one who will do battle for the compounds, and give us the other side of the case. On the North-Western I have searched in vain for an official or servant who will say a good word for the new engines. Many a time have I been met with the reply, "We must not say anything about them." Everyone dislikes the compounds, though it would not do to express it. Hence the reticence of the drivers. But when a driver has a good engine, did anyone ever find him unwilling to expatiate on its merits?

Crystallization of Iron.

From The Locomotive, published by the Hartford Boiler Insurance Co.

The question of the crystallization or molecular change in the constitution of iron under strain in such structures as bridges, boilers, etc., has always received considerable attention, and been the cause of much discussion. It has recently been revived, so that a few words upon the question so far as it relates to boilers may not be out of place here.

In the first place, it is assumed by the advocate of the crystallization theory that a moderate amount of strain, well within the limit of what would be considered safe, will, if long continued or often repeated, ultimately cause a crystallization of the material, which renders it brittle and liable to break at a much lighter load than would be required if the material were new, or with a load which would be perfectly safe if the crystallization had not taken place. Many examples have been cited to prove the correctness of this theory, and it has many able and earnest defenders. But we do not think it true, at least in the sense in which it is generally taken.

We have found that plates taken from boilers after a period of service of upward of twenty-six years were as good as new, and stood the test of flanging perfectly well. This they would not have done had they been deteriorated by the strains to which they were subjected during their long period of service.

It is a very frequent thing for boilers which have served a long term of useful life to be cut up, and the plates found to be in good condition.

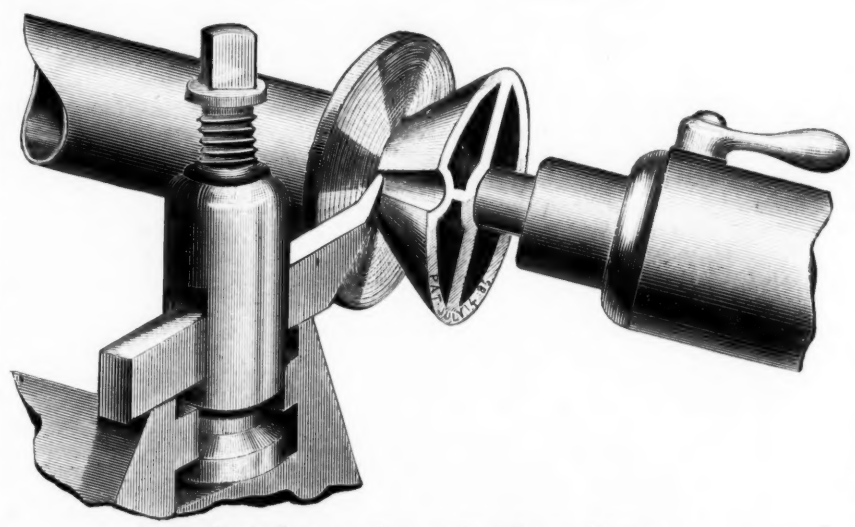
One element which no doubt has furnished much of the material for argument in favor of crystallization, is the fact that in built up structures of all kinds, calculations of stress are made upon the assumption that the proportions and workmanship are so nearly perfect that the strains on the various parts are just what they are supposed to be. This may lead to serious error; for it is quite within the range of possibility, if not of probability, that proportions and workmanship may be so much in error that when the structure is put together, the strains, instead of being uniformly distributed as they may have been originally intended, are so much localized that some portion may give way in a comparatively short time, and this in turn is quite likely to bring undue strain upon some other part, which fails in its turn, and may eventually lead to the destruction of the entire structure, while the true *modus operandi* of its failure may be unsuspected, and the result very naturally be attributed to some form of deterioration of the material.

For instance, we once saw a boiler in process of construction, and the operation of riveting was a marvel indeed. The holes didn't seem to come fair somehow; so two men with a drift-pin and sledge-hammers brought them fair. But the seam, when finished, was a curious sight. "Not straight by two inches," was the expression of one disgusted mechanic, and it seemed about so. It would be interesting to learn just how uniformly the strains on this seam would be distributed when the boiler was under steam, and just what its real factor of safety would be, compared with the calculated margin. These examples show how possible it may be for engineering structures to fail when the factor of safety is supposed to be large enough to meet any contingencies, when in fact there is no margin of safety; the strength of the structure as a whole being no greater than that of the weakest point.

But in the case of those portions of a boiler exposed to the direct action of the fire the case may be different, so far as deterioration is concerned. Here we have that most powerful of all physical forces, heat, to deal with, and this force will produce structural changes in any known substance if the conditions are right.

On this point our experience teaches us that where a boiler is made of good material, well put together, and properly cared for, no portion of it will suffer materially from molecular changes during the ordinary lifetime of a boiler. But on the other hand, if the boiler be made of bad material, or if the feed-water is of such a quality that much scale or sediment is formed, and it is not kept cleaned out properly, then the habitual overheating, which is possible, may so change the structure of the iron that it may be unfit for the purpose. But under these very unfavorable conditions we have known boiler iron to retain its good quality until actual overheating had occurred to such an extent that rupture occurred, simply because the plates were red-hot, and very weak in consequence. Good iron in such cases will generally rupture locally and no serious damage may be done, while if it is of a brittle character, the rupture may be so sudden and extensive that an explosion may occur.

On the whole it is safe to conclude that if a boiler is well made, of good material, and properly cared for, we need have no fear that it will become unsafe through molecular change in the plates.



Rich's Grooved Chilled Iron Lathe Center.

Rich's Grooved Chilled Iron Lathe Center.

This is a very convenient tool for the purpose of cutting and squaring pipe, columns or other cored work. The groove allows a strong tool to be used entirely past the edge of the hole; the groove also admits of a tool being worked in the hole far enough to true it up to the bevel of the center, true with the part faced.

In cutting threads on thin pipe the groove permits of the thread tool being run back far enough to take up the slack of the feed screw, a point which the machinist will appreciate.

The shanks of these centers are made of best machine steel, unless they are ordered made of tool steel; the centers are ground ready for use as soon as fitted to the lathe. Three regular sizes are made, fitting holes from $\frac{5}{8}$″ to 3″, $\frac{3}{4}$″ to 5″, and 1″ to 7″ respectively; larger sizes will be furnished if wanted.

The manufacturers are J. & G. Rich, 120 N. Sixth street, Philadelphia.

The St. Louis *Railway Register* which has been hurling its choicest anathemas at the Ohio & Mississippi Railroad since it was refused an annual pass over the line, has been trying to persuade its readers that the net earnings of the road are decreasing at a fearful rate. On the other hand the statement of the Ohio & Mississippi for the six months ending June 30, shows that the net earnings have increased 106.6 per cent. over the first half of last year. We know of no other cause of the increase than the determination of the managers to require the *Register* editor and other newspaper men to pay their fare like other people when they travel by rail. Let other railroads do likewise, and perhaps some of them that have defaulted on the interest of their mortgage bonds may soon be able to pay up.

LETTERS FROM PRACTICAL MEN.

Light Wanted on the Shafting Question.

Editor American Machinist:

I think a recent writer in the American Machinist struck the right chord in asking for particulars about turning shafting. I have turned considerable shafting, and have heard lots of stories about it.

One man said 300 feet of $2\frac{7}{16}$″ shafting was a day's work at an establishment in St. Louis. The only information I could get from him as to how it was done was that they had a new lathe from "Down East," and a man came with it to run it.

Another saw a 16-foot length of $2\frac{7}{16}$″ shafting turned in exactly 35 minutes. His description of the lathe was: "It was a double-header, and had three tools." Another concern gets away with 300 feet in ten hours, and so on. Most shops have some sort of a rig for turning shafting, but few of them can turn one-third as much as we hear and read about. There are lots of men who want to know *how it's done.*

If proprietors cannot afford to buy a shafting lathe, they could be persuaded to buy a good rig for the purpose if it was in the market. Somebody ought to make one, and with it furnish tables of speeds and feeds.

What makes articles from such writers as Hobart and Richards so interesting is, they tell us how the job was done. Will some one imitate them by telling us just how to turn 300 feet of shafting in ten hours? I can assure them the information will be appreciated. F. L. Johnson.

Why So Much Sunday Work is Done.

Editor American Machinist:

I have read with some interest the various comments and suggestions about Sunday work. Since the Saviour's disciples, on the Sabbath day, plucked the ears of corn and did eat because they were hungry, and were not rebuked by the Master, so men ever since have had an abnormal appetite, and have felt compelled to work on that day to satisfy its cravings. There are asses and oxen continually falling into pits in these days, as there were in the days when the Pharisees held the positions of moral lawgivers in Jerusalem, and, in many cases, though they tumble in on Monday they are allowed to remain there until Sunday, if, after due examination and deliberation, the conclusion is reached that the brutes will survive till then.

This point, however, has been well ventilated, and, I think, all will allow that there *are* some cases when labor must be performed on Sunday, which will result in the greatest good for the greatest number. But there is one point which has been overlooked, and which seems not to have been thought of, and I doubt not the statement will be questioned. It is this: I have found during 20 years' experience that the bulk of the Sunday work which is done, is done because it is the wish of the men who do it. While I have had little experience with Sunday work for outside parties, yet I have found that the repairs required to keep in order a plant in which are several engines and boilers can and would mostly be done nights or on holidays, were it not for the anxiety of the men to do the work on Sunday, rather than at any other time, and the yielding nature of the boss who permits them to do so. I have repeatedly had work to do which, in all likelihood would take but a few hours, and have as often been asked by the men, whom I have told to do the work at night after shutting down, if they could not do it on Sunday, urging, among other reasons, that it could be done better and with less danger by daylight than at dark.

I venture to say that there are men in every shop, who, if they could *privately* elect, would vote to work at least ever alternate Sunday. I say privately, because there is a a certain regard paid to the moral law and public opinion thereon.

I remember some ten or twelve years ago that the general manager of one of our largest railroads issued orders that no overtime be made that was not absolutely necessary.

This order had often been given before, and with but little effect—there seemed to be a tremendous lot of necessary work—but this time he clinched the matter with the order that when work had to be done, only single-time would be allowed for it. This was a terrific blow at Sunday work, and I venture to say that it was reduced 75 per cent. instanter, and the great force which caused the order to be obeyed was the sturdy opposition of the men to do extra work for single pay. Now, don't imagine that I think all the fault lies with the men. By no means. One great fault is, that employers pay extra for this kind of work, thus making an incentive for men to do it. Remove the incentive and see it stop.

But I hear some one ask, "Are you advocating that the poor laboring man should be compelled to work on Sunday for single time?" No. I think that if he has to work, he should get extra pay for it; but so long as he gets it, a large proportion of the work will be done on Sunday.

The whole thing I have used all these words to say can be summed up in this query: "If men received time and half-time for all overtime made, except on Sunday, and single time for Sunday work, how much work would be done on that day, think you?" Q. E. D.

Making Tight Boilers Without Caulking.

Editor American Machinist:

The question about making tight boilers without caulking as brought out in the discussion on boiler construction by the master mechanics, brings to mind one phase of the subject that has often occurred to me and one I have never heard broached, and that is, that certain edges of the sheets should be punched from different sides, and that for two reasons. First, the die is, and by rights ought to be, longer than the punch. This produces a conical hole. When both ends of a sheet are so punched from the same side and rolled into a hoop and the holes brought to coincide, the result is as shown exaggerated in Fig. 1; whereas, if the two ends of the sheet were punched from opposite sides, the result would be as shown in Fig. 2. A rivet is more likely to fill properly when driven in a hole like that in Fig. 2 than in Fig. 1.

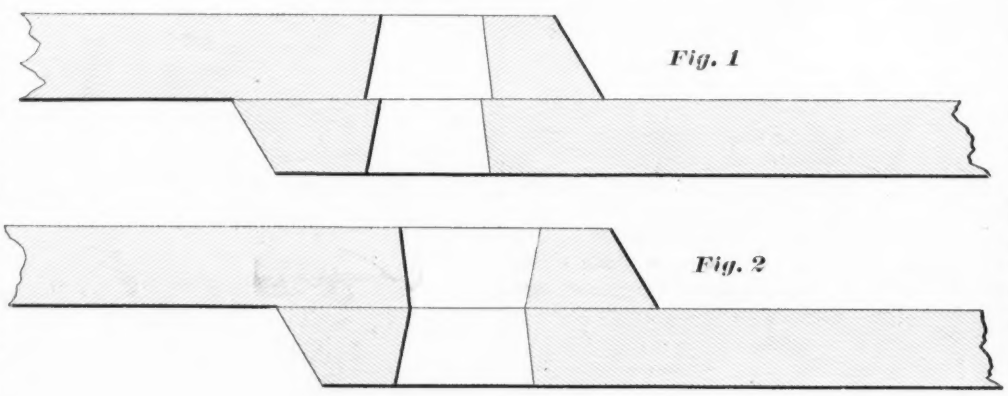


Fig. 1

Fig. 2

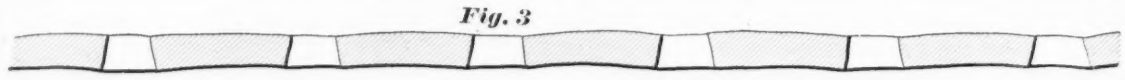


Fig. 3

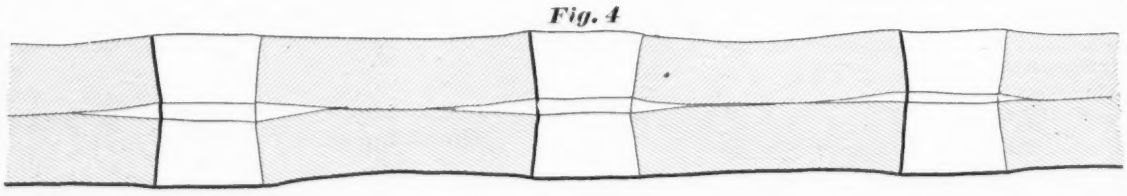


Fig. 4

In the second place, a row of holes punched in a sheet of metal, tends to produce the result exaggerated in Fig. 3. When two sheets so bent are brought together as shown in Fig. 4, and closed down at the rivet holes, they are pretty sure to be tight between the rivets. If the sheets were bent as much as shown by the drawing and riveted by a machine that had no device for closing the sheets, then the result might be bad, as the rivet would be likely to swell out and form a fin between the sheets, but as the sheets are curved but slightly in punching, and brought together with a closing device, the space between the sheets would be too small for the fin, and yet curved enough to insure a tight joint. John E. Sweet.

A Word Wanted.

Editor American Machinist:

"The drill cuts larger than itself." The invention of a simple, but expressive word to take the place of the above awkward sentence would be a boon to teachers in the machine shop. The beginner can at once understand, dull, sharp, straight, crooked, soft, nard, and very soon learn what "wobbling" is; but of that condition of the drill which makes it cut larger than itself, and which has no name, the teaching must be from first principles upward. One way to test a drill, is to start in to a full size cut and stop the press with the feed on. The lip which cuts ahead of the other one, and leaves a ridge, or ring, for the other to take out, is the one which needs grinding back.

F. J. Masten.

A Remedy for Defects in Heavy Forgings.

Editor American Machinist:

I think a little discussion on the above subject will be of a nature to throw light on this important branch of industry. If you have ever watched the making up of piles of scrap for blooms in a forge, you have very likely seen what I wish to call attention to, viz., pieces of iron with possibly an eighth to a quarter of an inch of rust and dirt on them, or, may be, a large nut or some hollow piece of iron, filled with gravel or some foreign matter that is not a very good flux for welding up iron scrap. A great many times a small bit of brass, copper or galvanized iron will find its way into the scrap heap, and thence into the furnace.

Now, we know that any one of these will cause an imperfect weld in the bloom, then it goes into the forging, and the result is a defective piece of work, the outcome of which we have seen many times in the way of heavy repairs on engines and other heavy machinery.

I recall a case that came to my notice a few days ago, in which a large connection was landed on the dock with a flaw in it that had been discovered, and a new rod was got out and put in its place, which would very materially reduce the profits of the job.

But what is the remedy? How shall we get rid of this dirt and stones, and be able to discover the bits of brass and copper?

My suggestion is that a tumbling barrel be constructed, with openings to suit the scrap that is to be worked, and the dirt will take care of itself; the brass and copper will be polished and expose itself. Let this be tried on one ton of scrap, and it will be surprising to see the amount of dirt being rolled every year for iron. Kid.

Babbitt Metal and Babbitting Boxes.

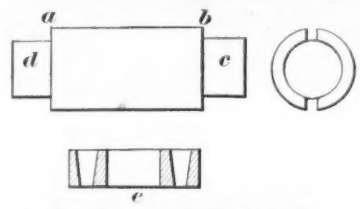
Editor American Machinist:

I frequently see inquiries about the composition for lining metal for boxes. The particular quality of metal that will serve the best purpose must be determined by the nature of the duty required. For instance, a slow-running, heavy bearing does no require as hard metal as a heavy, quick-running one. I have used the following for different purposes:

Lead 5,	antimony	1.
Lead 8,	"	1.
Tin 25,	"	2, copper 1.
Tin 8,	"	2, " 1.

The last-named is the best I have ever tried for saw arbors with self-oiling boxes.

I make a rig for babbitting boxes that works entirely satisfactory, saving time and metal. It is shown in the sketch. The body from *a* to *b* is turned the required size for box, and the ends turned, say $\frac{1}{8}$" all around smaller. Then mill out two slots, as



Rig for Babbitting Boxes.

shown in end view, $\frac{1}{8}$" wide, down to the ends; fit pieces in these slots for liners. One end as *d* fits in a plate or base, and the collar *e* is fitted to the other end. This collar has through it two holes, beveled out, for the metal to run in. The box is filled standing upright. Clamp the box to liners with the shaft standing in base-plate, put on collar and pour in metal; when set, wrench the collar around with a lever; that cuts off the sprues, then lift off collar, turn it over and the sprues will fall out. No loss of metal here.

The holes part way through the collar can be made larger, forming a sort of basin, but should be a quick taper, so the metal will fall out when the collar is turned over

S. A. D.

Balancing High-Speed Engines.

Editor American Machinist:

It may be interesting as well as instructive to C. L. Redfield (American Machinist, Aug. 15, 1885), and others, that the subject of the "over-hang" connecting-rod in balancing steam engines and other machinery, was thoroughly discussed in a paper by Prof. S. W. Robinson, before the American Society of Mechanical Engineers, and published in the American Machinist, November 5 and 12, 1881. C. A. Smith.

The *Tribune-Republican*, of Denver, says: "Probably the heaviest engine ever run through this city (ninety tons) laid over yesterday in the Denver and Rio Grande lower yards, waiting for last night's 9.55 train to take her to Santa Fe, where she is to run on the 200-feet-to-the-mile, 24-mile-long grade between Trinidad, in Colorado, and Baton, in New Mexico. There is a 2,800-feet tunnel on this line, and on this grade are run the heaviest locomotives in the country. Two sixty-ton engines are required to take a passenger train of six coaches up the big grade, one before and the other behind, because if the engines were doubled up, should a coupling break, the cars might get beyond control and be dashed to pieces down the grade. It requires two hours and forty minutes for the ascent; but descending, how they do fly sometimes! making flying switches that would sink the hearts of the switch-house men at the New York Grand Central Depot clear into their boots. No. 833, of the Philadelphia and Reading Railroad, the locomotive in question, came from Laramie City, where she has been hauling freight over the heavy grades between Laramie and Green River during the last sixty days to demonstrate the virtues of the Wootten patent fire-box, which is specially arranged for burning waste coal. Engineer E. J. Rauch says the trial is so satisfactory that the Union Pacific road will adopt the device, and the Santa Fe road will try this engine with the same end in view. The engine is rented out to roads wishing to try her at $50 per day and expenses, but the patent is owned by the Wootten Railroad Switch Company. She came in from Cheyenne Tuesday with a train, but the Denver and Rio Grande folks preferred to disconnect and tow her over their line on which she left last night."

Responsibility of Railroads in England.

A suit against a railroad company was tried in Manchester, England, a month ago before a special jury. The widow of a man who was killed in an accident on the road a year ago sued the company for compensation. When the accident occurred, the train (which was a long one) was approaching a siding at forty to fifty miles an hour, on a "forty chain" curve, down an incline 1 foot in 24. The outside web of the right-hand crank axle of the engine broke, and although steam was at once shut off, the train was derailed by tearing up the check rail, and nineteen persons were killed and five others subsequently died of their injuries. It was contended by the plaintiff that the flaw in the crank axle was so plain as to have been easily discoverable before the accident; and secondly, that the company was guilty of negligence in not equipping the train with an automatic brake. A Smith vacuum brake was used.

Druitt Halpin, a consulting engineer of high standing, testified that assuming the check rail penetrated through the bottom of the tender after Smith's vacuum brake had been put on, it would take the brake off, and if not on it would have prevented it being put on. Had such an accident occurred with a train fitted with the automatic brake the effect would have been to have applied the brake to the train, and if the brake had been already applied it would have locked the brake, and prevented the men taking it off. In his opinion all trains should be fitted with automatic brakes. With such a brake the train would have been brought to a stand in about 250 yards.

Mr. Perry F. Nursey, consulting engineer and editor of *Iron*, gave similar testimony.

The company had been warned before the accident that their trains were not safe without automatic brakes.

In giving his charge the judge said he would leave it to the jury, telling them what was the law as to negligence, whether as matter of fact it was negligence on the part of the company to run their trains without an automatic brake. It was difficult to say categorically what negligence was, but he might put it that if a railway company neglected to use any appliance to secure the safety of passengers which was almost universally approved of and used, that would be negligence. If all the railway companies in the kingdom but one used an automatic brake, it would be a question for a jury whether that one company was guilty of negligence, even though the brake used was one which had for years done its work satisfactorily. The jury should be satisfied whether negligence caused the accident.

After such instructions the jury brought in a verdict that the company could not be charged with negligence upon either ground of complaint. It seems, therefore, that automatic brakes must come to be almost universally used in England before railroad companies can be held responsible for loss of life through neglect to apply them to trains. This is a queer legal construction. It would not hold water in this country.

A New Exposition.

The following circular has been issued from the northern headquarters of the North, Central and South American Exposition, 234 Broadway, New York. The new Exposition seems to be organized upon a good foundation. It will doubtless be well patronized, and will be a good place to display machinery, especially for Southern and Spanish-American trade.

NORTHERN HEADQUARTERS OF THE NORTH, CENTRAL AND SOUTH AMERICAN EXPOSITION,
234 BROADWAY, NEW YORK, July, 18, 1885.

Hardly had the World's Industrial and Cotton Centennial Exposition closed its doors at New Orleans on the 31st of May last, when a new corporation was formed under the above title, with an ample capital, for the purpose of opening a new exposition during the ensuing fall and winter, which shall be conducted on purely business principles, and which shall, if possible, excel in extent and completeness even the famous exhibition of last winter, which now stands as the greatest hitherto known in the history of the world. That this hope will be realized is already assured by letters and applications for space from all sections of the country.

The North, Central, and South American Exposition neither asks nor expects pecuniary aid from the general government. It has purchased at a low figure the entire buildings and plant of the World's Exposition, and is now fully organized for business.

The board of managers consists of the following gentlemen, representing all sections of the United States:

Samuel B. McConnico, of New Orleans, President; Samuel H. Buck, of New Orleans, Director General; George M. Pullman, of Illinois; C. H. Barney, of New Jersey; R. S. Howard, of New Orleans; John B. Mead, of Vermont; George L. Shoup, of Idaho; Thomas L. Airey, of New Orleans; Frank Bacon, of Kansas; A. J. McWhirter, of Tennessee; B. D. Wood, of New Orleans; E. W. Allen, of Oregon; Thomas J. Woodward, of New Orleans; A. L. Abbott, of New Orleans; Richard Sinnott, of New Orleans. There is also an advisory committee of one hundred of the principal citizens of New Orleans.

The leading object of this new exposition will be to develop more intimate trade relations between the 55,000,000 producers and consumers of the United States and the 48,000,000 producers and consumers of Mexico, Central America, South America, and the West Indies; in other words, to stimulate an exchange of our surplus manufactures for their surplus raw materials.

The imperative necessity for a new commercial movement in this direction can best be appreciated by reference to the fact that of a total annual demand from those countries, amounting to $475.000.0000, the United States supplies but $77,000,000, or 16 per cent. Of the total annual exports of those countries, amounting to $479,000.000, the United States takes but $168,000,000, or 36 per cent. In other words, the exchanges of Central and South America are mainly with Europe.

To deflect this great and rapidly-increasing trade to our own ports is one of the fundamental objects of the exposition. Situated as New Orleans is, in the geographical and transportation center of the Western Hemisphere and near its center of population, it is the place above all others to inaugurate a hemispherical commercial policy.

While especial attention will be paid to the commercial interests of the three Americas, it is assured that large and interesting foreign exhibits will be forthcoming.

The Exposition Buildings cover nearly sixty acres, the main building alone having thirty-three acres under one roof. The collective exhibits of States and Territories will cover some ten acres more.

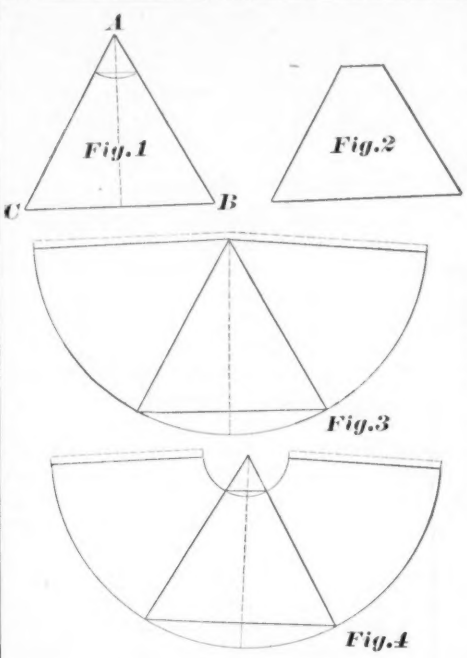
The Exposition will open November 10, 1885, and remain open until March 31, 1886. To the opening will be invited the President of the United States, of Mexico, and all the Spanish-American Republics, the Emperor of Brazil, and the Governor-General of Canada.

The undersigned, having been placed in charge of the interests of the exposition in the Middle States, an office has been opened at 234 Broadway (opposite the Post Office), in New York City, where detailed information may be obtained, and blank applications for space will be distributed.

The co-operation of the press is earnestly solicited, and newspapers in the States of New York, New Jersey, Pennsylvania, and Delaware are requested to favorably notice the exposition, as a matter of public interest.

Correspondence from business men and intending exhibitors is respectfully invited, and will receive prompt attention.

C. H. BARNEY,
Managing Director for the Middle States.
J. C. TRUMAN,
U. S. Commissioner.



Laying Out Sheet Iron and Boiler Work.

BY GEORGE MARSHALL.

SECOND PAPER.

THE CONE AND FRUSTUM.

These are the simplest forms to be laid out. They are, as here referred to, simple, plain ones; others will, in the future, be noticed.

To lay out a cone of any size, it is well to make a full-sized sketch of the piece you require. Fig. 1 is a side view of a cone, Fig. 2 that of a frustum of a cone.

To lay out this piece, where practicable set your compass or trammels, one point at *A*, Fig. 1, and the other at *B*, and describe a segment or part of a circle, sufficiently large to equal the circumference of cone at large end; and from any point on this circle, measure off your circumference according to rule laid down in last paper, adding or subtracting thicknesses of iron as described. If you desire to make a cone, you will then draw lines from the measured points up to *A*, add your laps, and the figure is complete.

If you desire to form the frustum of a cone, you will describe a segment of a circle as already stated, then alter your compass points to the height you require the cone to be, and strike another segment of a circle, and the measured points on the base or large end of cone carried up to the apex of cone at *A* will give the circumference at the small end, after which add laps as already described.

It may be necessary to say that in laying out work, accuracy in measuring distances and squaring of lines are absolutely essential for producing good work. In Fig. 1, by dotted lines, I show the upright or perpendicular line square with the base or bottom of cone. I also show a dotted line on same figure representing the height of frustum. In Figs. 3 and 4 the work laid out, according to Figs. 1 and 2 is represented. The dotted lines represent the lap allowance.

In laying out this piece the diameter to be calculated is represented in Fig. 1, by *B* and *C*, not by the circle described; that being the shape of the piece when laid out, and having no connection with diameter or circumference. I mention this as I have found many young men to whom I have given instruction calculating the circumference of the circle rather than the base of cone, and the same error I made when I first took instructions in this problem.

The sketch, Fig. 4, gives a view of the piece laid out, as in the preceding case dotted lines represent lap allowance. This piece if cut out and rolled up will be equal in dimensions to Fig. 2. Should flange be required on one or both ends it would be necessary to make allowance for same; this should be taken into consideration when selecting the plate of proper width from which to lay out the piece. It is at times necessary, in order to prevent waste of stock, to lay out a cone in more than one piece, in such case lay out in equal parts as ⅓, ¼ or whatever number may be best adapted for the greatest economy of material.

The Louisville Industrial Exhibition runs from Aug. 15th to Oct. 24th this year. These exhibitions are always interesting and profitable to visit.

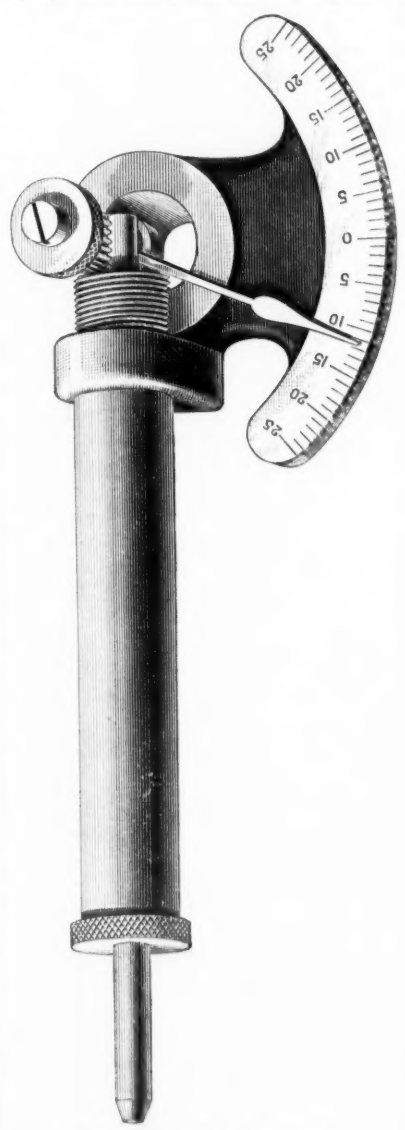
Any skilled, industrious man in this country who will save a fifth of his wages can in a few years become a capitalist. Most of them could, if they would deny themselves awhile, save two or even three-fifths of what they earn.—*St. Louis Miller.*

If our contemporary speaks from experience we are glad to see it so prosperous and shall watch for the coming forth of its proprietor and all employes as capitalists "in a *few years.*"

Hand's Indicator for Use in Setting Out Piston Packing.

The ordinary plan in setting out piston packing is to use a pair of calipers, or some substitute, for determining when the piston is central in the cylinder. The engraving represents a device for this purpose designed to supersede the use of calipers, and to expedite the operation. It is calculated for use on locomotives, stationary and other classes of engines.

To use this a bushing is bored to fit the tit or projection that guides and centers the follower; the outer end of this bushing is turned to fit in the hole shown in back of indicator; a set screw holds this bushing in place in the indicator. The instrument is inserted in the cylinder, the point of the rod, shown below the barrel, in contact with the bore.



PISTON PACKING INDICATOR.

This rod extends up through the barrel, its upper end for some distance being fashioned as a rack, the teeth of which engage the small pinion that actuates the indicating hand. When in place, by loosening the knurled nut near the indicating hand, the latter is set at 0 on the graduated arc.

If now the indicator is turned around, if the piston is central the hand will remain at 0, if out of the center the hand will move over the index scale. The graduations are such as represent one-hundredth of an inch out of center in the cylinder, but the motion is so multiplied at the hand that the graduations on the index are one-tenth inch apart. A variation hardly measurable in the cylinder is thus so magnified as to be very plainly shown on the graduated arc.

The end of the rod passing through the barrel is by means of a long spiral spring, (inside the barrel) always kept in contact with the bore of the cylinder, and the index hand in a corresponding position.

These indicators are made in a variety of sizes; the one shown is intended for use in cylinders from 16″ to 19″ inclusive.

Manufactured by S. Ashton Hand Manufacturing Co., Toughkenamon, Pa.

The great Brooklyn Bridge employs 362 men who draw pay. The president has a salary of $5,000; the chief engineer and superintendent, $6,000; first-assistant engineer, $4,000; second assistant engineer, $3,600: chief mechanical engineer, $2,000; first-assistant engineer (in power department), $1,300; two assistant engineers, $1,200 each. The master machinist gets $1,872 a year. Some mechanics are paid by the hour, as follows:

	cents.
1 Assistant foreman, per hour	35
1 Engineer, per hour	27½
3 Machinists, per hour	30
6 Machinists, per hour	27½
1 Machinist, per hour	25
2 Helpers, per hour	22½
1 Foreman blacksmith, per hour	50
1 Blacksmith, per hour	40
3 Helpers, per hour	20
6 Locomotive engineers, per hour	35
2 Locomotive engineers, per hour	30
8 Locomotive firemen, per hour	20
1 Foreman of repairs, per hour	33
1 Locomotive machinist, per hour	30
1 Pipe fitter, per hour	30

The railroads of Pennsylvania employ about 70,000 wage workers, the working time of which is computed by the month. In no other industry in the State is the average wage-worker assured as regular and as full working time as that given to employes in the service of railroad companies, and, as the necessities of the business require the employment of nearly every class of mechanics, a table of wages paid to wage workers in the employ of railroad companies will show, if the value of full working time be taken into consideration, the highest average wages paid to train men, mechanics and laborers.—*Report of Penn. Bureau of Industrial Statistics.*

Recent experiments in Germany afford additional evidence of the practicability and economy of electric lighting for cars. The dynamo was driven from the axle of the baggage van. Besides the van, the train had a first, second and third-class carriage, and was lighted by twelve incandescent lamps. The light was perfectly steady at variable speeds, and during stoppages at stations. At the end of six weeks' running the apparatus was found in perfect order. The cost of the lighting is estimated at ten cents per lamp per hour. After awhile we shall have it. The indications are all favorable.—*National Car Builder.*

A great deal is written in this country about negligence in the Patent Office, leading to the issue of conflicting patents. We think, in this respect at least, that British patent laws or practice is no better than ours, as a very material part of the correspondence of technical journals there is devoted to showing that recently issued patents are for old inventions by someone else than the patentee.

The *Railroad Gazette* of Aug. 7, reports 1,305 miles of new railroad built so far this year, against 1,859 miles for same time last year, 2,796 miles for 1883 and 5,667 miles for 1882. This statement covers main track only.

According to the best figures obtainable, the blast furnaces of the country have over 600,000 tons of pig iron on hand. There are 227 furnaces in blast, the greater part of the furnaces being out of blast.

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☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those especially interested in the occupations we reprsent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, AUGUST 29, 1885.

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Progress of Steel Castings.

We are pleased to be able to present this week a number of letters from master mechanics of the principal railroads of the country, giving their experience in the use of steel castings on locomotives in answer to our inquiries addressed to them. The interest taken in the subject at the convention of the Master Mechanics' Association in Washington, showed that the merits of steel castings for certain parts of locomotives are more widely appreciated than had been supposed by many who had not tried them. A knowledge of the results of experience in use is greatly in demand, and to collect the knowledge and make it public we instituted our inquiries. We present all the letters thus far received that give any experience, and must call attention to the universal conclusion of all who have tested the merits of steel castings as compared with iron, in favor of the former. Those who have had the widest experience are the most positive in their declarations of the advantages of steel castings on locomotives. The general master mechanic of a road having over 4,800 miles of track, and running 658 locomotives, who uses steel castings for various kinds of locomotive work, gives the results of experiments he made which demonstrated that cast steel stood a tensile strain of 86,000 pounds, Ulster iron 60,000 pounds, and common wrought iron 40,000 pounds. The steel elongated but $\frac{1}{32}$ of an inch when it broke, the common iron $\frac{1}{4}$ of an inch and the Ulster iron $\frac{1}{2}$ an inch. As he says: "this shows a remarkable strength." The superintendent of motive power of another road having about 3,800 miles of track, writes, that he uses steel castings entirely for crossheads and largely for rocker arms, and many other parts where he formerly used cast iron. He had used them for a number of years in locomotive work and other machinery with excellent results. On one leading road, as the superintendent of motive power writes us, the breakages of cast-steel crossheads "are none as compared with cast-iron for the same purpose." This is an important thing to consider as broken crossheads often cause a great deal of damage. Another superintendent of motive power writes that the first cost of steel is about as three to one, but he believes the steel is cheaper in the end.

The great drawback to steel castings has been the difficulty of getting them solid, but such has been the improvement in making them that this difficulty is now largely removed. Steel castings as made to-day are altogether superior to those made a few years ago. A perusal of the letters on our first and second pages of this issue will convince the most skeptical that steel castings for locomotives have been made a decided success. Their use will be largely increased and extended to other roads that have not given them a trial. This will be an advantage, not only to the companies, but to the public who ride over the roads, in strengthening the security against accidents caused by breakage on locomotives.

Electric Motors on the Elevated Roads.

It is now several months since the information was spread through the daily press and otherwise that everything was about in readiness for the trial of electric motors on the elevated roads in New York, and that these trials would be made in a few days. Trial is hardly the word, since, according to the expressions of those interested in the enterprises, success was assured, the trial being merely a necessary formality. Innumerable advantages were to flow from the substitution of electric motors for the locomotives now in use. The service was to be better, and unfortunate pedestrians obliged to cross the streets under the tracks were to be saved from water, oil and cinders, with which, mainly in other people's imagination, they were deluged. These were to be the public's share. Whether, in addition, the citizens were to be saved from the iron dust from the rails, wheels and brake shoes which, if reports are credited, must be rapidly making consumptives of them, has not been definitely stated. Great financial saving to the companies operating the roads was to compensate them for the change.

But time flies, and those who have been watching and waiting for the electric motors have become tired in doing so; we are not over-stating it in saying that the general impression caused by the unexplained delay is that the companies controlling these motors do not dare submit them to a trial; that they are serving their purpose much better where they are. No one believes that trains on the elevated roads cannot be propelled by electric motors. Six months ago many believed that such propulsion was practicable, but just now this number is comparatively small. The general impression is, and in this we share, that so far no electric motor has been devised that is suitable for this service, and that with present knowledge and methods it is not probable that one will be devised that will perform the required work as cheaply as the locomotives now employed. These are doing the work, notwithstanding loose talk to the contrary, in a way that will, we believe, impress any unprejudiced engineer who will give a little time to investigation, as being very satisfactory and at a very moderate cost, considering the nature of the service, both as to fuel consumption and maintenance.

A good deal has been said and written about delays in getting the electric motors at work being caused by efforts to "consolidate interests," &c. True or not true, such stories are no longer believed. Expressions about the "wonderful" power of the electric current are of no further interest. They do not move even the uninitiated. Nothing but successful trial will have an effect satisfactory in any degree. As the matter now stands the power required to move the trains on the road has been grossly understated. This may have been merely a mistake, but it does not inspire confidence in the advocates of electric propulsion.

We hope these trials will not be longer delayed. Numerous patents control the manufacture and use of electric motors, and if they are good things this gives the public some rights in their enjoyment. We shall be glad to chronicle their entire success when it is demonstrated.

Railroad Operations in 1884.

Any one wishing to make a special study of railroad progress and railroad traffic in this country can find abundant material in "Poor's Railroad Manual" for 1885, lately issued. As far as extension of tracks and facilities for transportation are concerned, the study will show gratifying results; but, as regards net earnings and payments of fixed charges, there is much to contemplate that is unfavorable. The railroads of this country represent the investment of an immense capital, and employ a great army of men. Whatever affects their continued prosperity makes itself felt upon the prosperity of the community at large, and conversely whatever promotes or abridges the prosperity of the whole people has a corresponding effect upon the railroads. We quote an abstract of statistics given in the "Manual:"

The total railroad mileage of the United States at the close of 1884 was 125,379 miles—more than 45 per cent. of the total mileage of the world. The cost of this mileage, with its equipment, measured by the amounts of their stocks and debts, was $7,676,399,054, of which $3,762,616,686 was stock, $3,669,115,772 bonds, and $244,666,596 unfunded debt. During 1884 there were moved 334,570,766 passengers a total distance of 8,778,581,061 miles, the average trip of each being 26.24 miles. The tonnage traffic of the year equaled 490,074,749 tons, each of which was hauled an average of 114 66 miles. The gross traffic earnings of all the railways were $770,684,908—a decrease from 1883 of $53,088,016. Of these gross earnings, $206,790,701 were from passengers, $502,869,910 from freight, and $61,024,297 from miscellaneous sources. Net traffic earnings were $268,106,258, or 34.79 per cent. of the gross; and there were paid for interest, $176,694,302; and for dividends, $93,244,835.

It is next to impossible to arrive at the actual cost of building and equipping the railroads, for it is well known that the roads never cost a sum near as large as the aggregate amount represented by the par value of their stocks and bonds. Yet they are all expected to earn enough some time in their history to pay interest and dividends upon the whole seven thousand six hundred and seventy-six million dollars. It is owing to Wall street and its methods that the railroad system of the country is required to carry this mountain of financial obligations. The evil is not over-production, but over-capitalization. When a railroad cannot earn full interest upon the amount of bonds with which the Wall street syndicates determine it shall be loaded, the holders of these bonds, who, perhaps, have been allured into purchasing by false statements, are placidly asked to compromise and take what the managers are disposed to offer. In most cases, they accept the compromise, because, in a legal contest, they see that the managers have nine points of advantage out of every ten. Compromises have been many during the past year.

The losses in new railroad ventures are large, but the capital is not drawn from the syndicates; it comes from the pockets of unsuspecting investors throughout the country. A new lot of investors comes to the front every year, and the same old syndicates go through with their capitalizing and compromising programme. Many daily newspapers are loud in their calls for reform in political office-mongering, but there is far more need of reform in railroad financiering.

Last year 3,977 miles of new railroad track were built. Earnings decreased from 1883 on the whole railroads reporting $798 a mile. About two per cent. more interest was paid in the aggregate than in 1883. The decrease of dividends was at the rate of about 8.8 per cent.

The number of persons transported equaled an increase of 7.8 per cent. over 1883, but the amount received per passenger per mile fell off from 2.422 cents to 2.356 cents. The amount of freight carried increased about 1½ per cent. over 1883, but the rate received per ton per mile fell from 1 236 cents to 1.124 cents. The decline in the earnings of 1884 was due to lower rates for freight and passengers.

In their introduction to the volume the Messrs. Poor say:

Of the 40,000 miles of line built in the five years ending with 1883, no small part was built on speculation, and for that very reason paralleled already existing lines. The most striking examples of the kind, examples so often adduced, are the West Shore and "Nickel-Plate" lines. The general demoralization which has prevailed in railroad circles is due more to the construction of these two, and to the ill fortune which attended them, than to any other cause, or it may be said to all other causes. Their effect has been to stop altogether the payment of dividends which had been paid for a long time at high rates by the Lake Shore and Michigan Central, and to reduce those paid on the New York Central from two per cent. quarterly to one-half of one per cent. quarterly. The stoppage or reduction of dividends on these great lines created profound apprehension and distrust as to the value of all railroad properties. The earnings of other great trunk lines suffered in like manner if not to the same extent. A general disruption of the relations previously existing between the companies was the inevitable result. They seemed to be set wholly adrift without chart or compass. In the distrust and incoherency which prevailed, the various lines, especially the great trunk lines, struck out on their own account, and bid wildly for business with very little reference to rates or to the result. Pools were dissolved almost as soon as they were entered into, as they always will be dissolved whenever there is not enough business to go round.

The pools seem to be about ready to form again. When they do form rates will be advanced. A boom in the stock market seems to indicate confidence in more remunerative railroad business. Railroad companies will demand that the public make good their losses sustained in fighting each other.

The earnings of the railroads in the ten Southern States were about three per cent. greater in 1884 than in 1883, in spite of reductions in rates and general depression. This fact indicates solid industrial progress in that section of the country. It is largely owing to the establishment of new manufactories in those States.

If the financial part of railroad operations

were as well and as honestly conducted as the mechanical part, our railroad system would be the wonder and the admiration of the world in all its aspects.

Mr. Hobart's story this week, about John the machinist who became a chronic drunkard, must not be understood as pointing out a weakness in any way peculiar to machinists or mechanics. It is decidedly bad for any man to acquire an uncontrollable thirst for rum, but we have no sympathy for those blatant demagogues who are constantly crying out that "rum is the greatest enemy of the workingman." It is no more the enemy of the mechanic or workingman than of the professional man or the capitalist. Men in every occupation have been thrown by it.

We frequently receive samples of boiler scale, with a request that we state what can be used as a solvent, or to prevent formation. These are questions that can seldom be answered, except after chemical analysis, and as the matter would be of no interest to our readers, except to those asking for the information, we do not feel called upon to have their samples analyzed. There are chemists who will undertake it for a fair compensation, or the Hartford Steam Boiler Inspection and Insurance Company will do it free of cost for its patrons.

The Norwalk Lock Company have decided to boycott the Knights of Labor, and have discharged all the Knights in their employ, some of them having been engaged in the works for fourteen years. Of course the Knights of Labor have decided to boycott Norwalk locks throughout the country. Thus the war is waged. It is likely to inflict considerable injury upon the combatants, but it is hard to see where any benefit comes in.

W. H. Wiley, 15 Astor Place, New York, has personally assumed the American agency of *Engineering*. He announces that the journal will contain an increasing amount of articles by American engineers in addition to the regular articles by foreign writers. The subscription price has been reduced from $10 to $9 for thin paper, and from $11 to $10 for thick paper. Mr. Wiley will keep a limited supply of back numbers on hand.

Since the Secretary of the Navy has taken the construction of the Atlanta, the Chicago and the Boston out of the hands of John Roach there is considerable speculation about where he will have them completed. Matters are dull at the Brooklyn Navy Yard, but it would not be surprising if they became very active before election.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(250) I. C. R., Elyria, Ohio, asks: What should be the length of grate bars for a boiler 54 inches diameter, 16 feet long, 48 tubes 4 inches diameter? *A.*—Use grate 6 feet long.

(251) D. J., Christianna, Pa., asks: 1. Will a large siphon, say of pipe 2 feet or more diameter, raise water the same as a small one, say of ¼-inch pipe? *A.*—Yes. 2. Does a shotgun ever burst above the wad that is over the shot? *A.*—We should think not, unless there is some obstruction at or near the muzzle. 3. How is the thickness of metal for a steam-engine cylinder calculated? *A.*—See article by J. G. A. Meyer, in AMERICAN MACHINIST of August 22.

(252) T. S., New York, asks: What is meant by using steam expansively, and how can it be so used? *A.*—When steam is admitted to the cylinder for part of the stroke of the piston only, and then the supply cut off, steam is used expansively for the remainder of the stroke. Steam is, to some extent, used expansively in almost all steam engines, but an engine in which the cut-off is before half-stroke is more particularly referred to as working expansively.

(253) L B, New Orleans, La., asks: 1. At what speed will a double engine, 3″x4″, drive a boat 25 feet long, 5 feet beam? *A.*—It ought to drive it 10 miles an hour. 2. What size boiler will be required? *A.*—Boiler with 100 feet heating surface. 3. Would not a compound engine be more economical than the double engine? *A.*—We should not recommend so small compound engines. 4 Using a 3″x4″ high-pressure cylinder, what should be the size of low pressure cylinder? *A.*—5″x4″ will do very well.

(354) W. K G., ——, asks: 1. Suppose a locomotive is standing with crankpin on the forward center with reverse lever in the forward motion; if, now, the lever is put in the back motion, what is the rule for finding how much the valve will be moved, all the lengths, distances, lead and lap being known? *A.*—We do not know how to put it in the form of a rule. The *exact* motion of the valve depends upon a great variety of conditions, and a mathematical solution would be a very tedious operation. 2. How much more power will a 16″x24″ engine exert than a 16″x22″? *A.*—The power that will be exerted in either case depends upon the piston speed and mean effective pressure. At the same number of revolutions the piston speed of the 24″ stroke would be about 9 per cent. greater than the 22″ stroke; hence, with the same mean effective pressure, the power developed would be 9 per cent. greater. Whether there will be the same mean effective pressure depends upon the speed, port area, character of the valve motion, etc. 3. Which will make copper softer, heating and cooling in the air or in water. *A.*—Water.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Patents. Fees $10 up. Write Hill & Co., 165 B'way, NY

Air Compressors, Rock Drills. J. Clayton, B'klyn, N.Y.

Curtis Pressure Regulator and St'm Trap, July 4, p 15

Edw. Sears, wood engraver, 48 Beekman st., N.Y.

Presses & Dies, Ferracute Mach. Co, Bridgeton, N J.

Steel Name Stamps, &c. J.B. Roney, Lynn, Mass.

Katzenstein metallic packing, 169 Christopher st., NY

Treatise on gear teeth and bevel gears; specimen pp. free. Geo B. Grant, 66 Beverly st., Boston, Mass

The Best Upright Hammers run by belt are made by W. P. Duncan & Co, Bellefonte, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Send for new catalogue of tools for amateurs; just out. Hartford Tool Co., Hartford, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts, New York.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John st., N. Y.

Machines to form and bend steel and iron; run by power. Williams, White & Co., Moline, Ill.

Improved Labor-Saving Upright Drills; prices reasonable. Currier & Snyder, Worcester, Mass.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Foot-Power Machinery for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Universal grinders for lathe-centers, chucks, angles, or cylinders. C.C. Hill, 84 Market st., Chicago, Ill.

Lyman's Gear Chart. How to lay out gear teeth. Price, 50c. E. Lyman, C. E., New Haven, Conn.

Light, fine, interchangeable mach'y to order. Foot lathe catalogue for stamp. E.O. Chase, Newark, N.J.

Selden Packing for stuffing box, with or without rubber core Randolph Brandt, 38 Cortlandt st., N.Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

Farley's Reference Directory of the Machinists', Iron, Steel and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co, Collinsville, Conn.

The outline ("wax process") engravings shown in the AM. MACHINIST each week are made by Struthers, Servoss & Co., 24 to 34 New Chambers St., N.Y.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught;" $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Wanted.—Mechanical Automatic Figures. Must be new and *original* design, and *work naturally*. Address, with full description and price, Lock Box B, Waterbury, Conn.

Morrison's Practical Engineer, a complete treatise on steam and general machinery. Price, $1; mailed free Indicators, Engineers' Instruments and outfits. W. A. Morrison, Box 373, Lowell, Mass.

Where an ordinary hand-damper is used, we furnish Kellam's Automatic Steam Damper Regulator guarantee saving 7 to 10 per cent. in fuel and give 30 days' trial. Hine & Robertson, 12 Cortlandt st., N Y.

Locomotive Engine Running and Management. By Angus Sinclair Gives full directions about handling and repairing locomotives; instructs how to design valve gear and set valves; Westinghouse air brake explained by aid of engravings. Price, $2. For sale by *National Car Builder*, 187 Dearborn st., Chicago, Ill.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent. on orders for five or more copies.

MANUFACTURES.

Sharpsburg, Pa., will spend $60,000 for water works.

Haight & Clark, Albany, N. Y., will erect a new iron foundry.

Cairo, Ill., wants a private company to build water-works.

Oliver McKenny is building a cotton seed oil mill at Athens, Ga.

H. Pacpoke will erect a $10,000 factory at 336 Sangamon street, Chicago.

The Syracuse Oil Stove Co., Phœnix, N. Y., will erect works at that place.

Cheney Bros. are building a large silk mill at South Manchester, Conn.

The Rebstock Stove Co., of Buffalo, N. Y., will erect works on Main street.

Joseph Yates, 296 Mott avenue, New York, will erect a foundry on 136th street.

The Wilmington & Weldon Railroad Co. talk of enlarging their shops at Florence, S. C.

The Fredericksburg & Potomac Railroad contemplate building new car shops soon.

It is said that the Delaware & Hudson Canal Co. will erect repair shops at Syracuse, N. Y.

Charles F. Newman, 236 Fifth street, New York, will build a three-story shop, to cost $18,000.

G. M. Horton and others have formed a company at Attleboro, Mass., to start a brass foundry.

The Boston Globe Nail Co. has concluded to do no work on Saturdays throughout the summer.

Waynesboro (Ga.) Cotton Seed Oil and Fertilizer Co. are building an oil mill of 30 tons daily capacity.

Robert Ridgeway, of Ridgeway, Outline & Smith, Marion, Ind., will build a $30,000 tile factory in Louisiana.

The Brush Electric Co., of Baltimore, are putting a Ball engine into their central station to run their day circuit.

Eugene Doherty, North 9th and 2d streets, Brooklyn, N. Y., will erect a three-story rubber factory, to cost $12,000.

The barb wire manufacturers recently held a meeting, formed a pool, and decided to advance prices 15 per cent.

A company is being organized to build a 200-barrel flour mill in Birmingham, Ala.; the capital stock will probably be $50,000.

The Colt's Arms Co., of Hartford, Conn., are running ten hours a day with 550 men. They have orders for 44 Gatling guns.

Hyde Park, Ill., wants pumping engines to pump 12,000,000 gallons of water a day. Will receive proposals up to September 7.

The Pratt & Whitney Co., Hartford, Conn., have received an order from the Government for five of the improved Gardner guns.

Samuel Trethewey & Co., 49th street, Pittsburgh, Pa., will erect a factory to manufacture tools for rolling mills. Will employ 50 men

The iron furnace at the State penitentiary, Rusk, Texas, will be rebuilt under the supervision of Robert A. Barrett and blown in again.

The taxes of Nichols, Shepard & Co., the large threshing-machine manufacturers at Battle Creek, Mich., are said to amount to one-tenth of the entire city's taxes.

The United Scythe Manufacturer's Association recently held a meeting at Springfield, Mass., elected officers, adopted a new price-list, and agreed to limit production.

The Howe Sewing Machine Co. has sold a portion of its land at Bridgeport, Conn., to outside parties, who, it is said, will erect large machine works and employ 300 hands.

The Chattanooga Plow Works, Chattanooga, Tenn., have increased their capital stock with a view to making some improvements, building a large warehouse, etc.

The Consolidated Safety Valve Co., 111 Liberty street, New York, have bought ground in Bridgeport, Conn., on which to erect new works. The present works are in Boston.

The Mellert Foundry and Machine Co., of Reading Pa., are making preparations to begin the erection of extensive new buildings on the tract of land they recently purchased.

The Chateaugay Ore and Iron Co., of Plattsburgh, N. Y., are about to extend their railroad five miles (making it 39 miles long), and build a new blast furnace. Hon Smith M. Weed is secretary of the company.

Among those who are to erect Clapp-Griffith steel plants are, Jones & Laughlins, Pittsburgh, Pa.; Harrisburg Nail Co., Harrisburg, Pa.; Paxton Rolling Mill, Harrisburg, Pa., and Schoenberger & Co., Pittsburgh, Pa.

Fort Worth, Texas, is soon to have an extensive cotton mill. The $12,000 subsidy asked for by the mill men has been subscribed, and it is expected that work on the mill will soon commence.

The South Norwalk (Conn.) Co-operative Hat Co. have leased the building of late occupied by Henry R. Fitch as a planing-mill, and will have it refitted for their occupancy until a factory is erected on their recently purchased grounds.

The necessary amount of stock to secure the business of manufacturing electric clocks in Attleboro, Mass., has been guaranteed, if a committee of investigation report favorably upon the condition and future prospects of the company.

The Ferracute Machine Co., Bridgeton, N. J., have issued a new illustrated catalogue of presses, dies, and can-making machinery. It contains 80 pages, and describes a large variety of machines for working sheet metals. It is well printed, and the descriptions are well written.

The Albany & Rensselaer Iron & Steel Company is to be reorganized as the Troy Steel and Iron Company. The capital stock, $2,500,000, has all been taken. The works in Troy are to be greatly improved, and three new blast furnaces built on Breaker Island, opposite the present works.

The Old Colony Railroad has just built at South Boston a new locomotive, which is the heaviest in the service of the company. It has cylinders 17x24 inches; the driving wheels are 5 feet 7 inches in height, while the entire weight is 91,500 lbs. The Boston & Maine Railroad is building four engines of as great weight.

The Frankford Co-operative Company, of Frankford, Philadelphia, with a capital of $20,000, has been chartered at the State Department. The object of the company is the manufacture of cotton, silk, linen, and other materials into textile fabrics. The treasurer is Wm. Tilton, of 4539 Frankford avenue, Philadelphia.

We have received from A. L. Ide & Son, Springfield, Ill., "Catalogue B" of the Ide engine, dated July, 1885. It is well illustrated by large engravings of the engine, showing its construction in all essential parts. The description is ample. Several indicator diagrams are given. This engine seems to be meeting with success.

Over $5,000 passed through the Central Labor Union of New York City from June 1, 1884, to June 1, 1885, for the benefit of trades on strike. Of this amount, $3,364.79 went to Hocking Valley, and nearly $500 to the bricklayers of New York City. With the exception of nearly a thousand dollars, the whole of the money went out of New York City.

Fully 300 mechanics in the West Shore railroad shops at Frankfort quit work July 24. Wages for two months and twenty-five days are due them at rates varying from $2 to $3 per day. The master mechanic could not tell when the pay car was coming. The men were quiet and orderly, but resolved to do no more work, nor to let any others work, until two months' wages were paid and a day fixed for payment each month.

W. L. Chambers and Moses Brothers, of Montgomery, Ala., and others, have organized the Calera Land Co., with a capital stock of $500,000. The company have purchased large tracts of land (reported 14,000 acres) in and around Calera, Ala., including several manufacturing enterprises. The object of the company is to build factories and develop the mining and manufacturing interests of Calera and the surrounding country.—*Baltimore Manufacturers' Record.*

Low water in the Merrimac river has caused some trouble among manufacturers who depend on water-power. But as the larger part of them have put in steam engines to supplement the water-power, but little stoppage is reported. The Lawrence *American* says: "It seems a settled fact that far less water flows in the Merrimac now than years ago, and that it is constantly decreasing. It is, then, only a matter of time when all the mills along the river must run altogether by steam."

The *Industrial Journal*, of Bangor, Me., says "The Katahdin Charcoal Iron Co. was organized in this city last Friday by the choice of the following officers: President, Chas. V. Lord, Bangor; secretary and treasurer, Henry McLaughlin, Bangor; directors, Chas. V. Lord, F. A. Wilson, C. A. Gibson, and E. M. Hersey, of Bangor, and A. P. Gould, of Thomaston; general manager, O. W. Davis, of Bangor. Good progress is being made toward rebuilding the works destroyed by fire, and the fires in the furnace are expected to be burning before the snow flies.

The Des Moines (Ia.) *Trade Journal* says: "Des-Moines needs more manufacturing institutions. This branch of industry has not kept pace with the city in other respects. Our home institutions are doing nobly, and all of them are prospering, and increasing and enlarging their factories and facilities as the city grows larger, but what we need are more new factories in other lines of manufacturing. We have good foundries, good machine shops, wire factories, boiler factories, distilleries, starch works and many others, but we need wagon factories, carriage factories, in fact, all the agricultural implements used in Iowa could be manufactured in Des Moines just as cheaply as elsewhere. We now have a city of over 42,000 inhabitants. It is the capital of the most productive Western State, and its facilities are unsurpassed by any city in the great West. We have water facilities and plenty of cheap fuel, public-spirited and energetic business men, and there is no good reason why money invested in the manufacturing business in Des Moines could not be made to pay a good interest."

Vincennes, Ind., Clyde, N. Y., Wellsboro, Pa., and Addison, N. Y, are to have water-works.

Huston & Mills, of Akron, Ohio, have purchased ground in Dayton, Tenn., on which to erect a foundry and machine shop.

Griffith & Wedge, Zanesville, Ohio, have been incorporated as the Griffith & Wedge Co. They build mining machinery, portable and stationary engines, boilers and saw mills.

Machinists' Supplies and Iron.

NEW YORK, Aug. 13, 1885.

The general character of the supply business and machine and tool manufacture shows no change. Complaints are not so much against dullness in the way of sales, as against the small margin for profits. Buyers seem still to hope for lower prices, but dealers and manufacturers say there is no further room in that direction. Anything that would tend to stiffen and slightly advance prices would, at this time, result in a material increase of orders. In stationary, and especially in falling prices, there is always the probability of buying cheaper, and this accounts in a great degree for the universal inclination to buy small lots.

Iron—American pig sells slowly, with prices in favor of buyers. Furnacemen show an inclination to get rid of any slight accumulation they may have, and are making some concessions to that end. Buyers are not inclined to buy beyond their requirements for immediate consumption. Standard brands of No. 1 X Foundry are quoted at $17.50 to $18; No. 2 Foundry, $15.50 to $16; Grey Forge, $13.50 to $14.50. Sales have been made, in small lots, at considerable discount from these figures.

Scotch Pig—There is but little doing in these brands. We quote Shotts, $19.50 to $20; Coltness, $19.50 to $20; Glengarnock, $18.50 to $19; Gartsherrie, $19 $19.50; Summerlee, $19 to $19.25; Carnbroe, $18.50 to $19; Eglinton, $17.50 to $18; Langloan, $19.50; Dalmellington, $18 to $18.25.

Copper—The market has ruled quiet and steady, with asking prices for Lake, 11¼c.; with 11c. to 11⅛c. offered; other brands are held at 10⅜c. to 10⅝c.

Lead—Holders are asking 4.25c., with 4.20c. offered. The result is that there are but few transactions.

Tin—There has been considerable decline in prices in London, and prices here are a little lower. Buyers are placing orders sparingly. We quote, for jobbing lots of Banca, 20¾c.; Straits and Malacca, 22c. to 22¼c.

Antimony—Hallett's 9c.; Cookson's 9½c.

Spelter—4.75c. to 5c.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Situation as foreman or supt. of machine shop. Lock Box 568, Philadelphia, Pa.

Two first-class machinists want situation; state if open for both. Address W. & M., AM. MACHINIST.

Wanted—Situation as foundry supt. or foreman. Best reference. Address Founder, AM. MACHINIST.

Mechanical engineer, thoroughly practical, desires engagement as salesman or representative. "Saxon," AM. MACHINIST.

Wanted—By a lad, an opportunity in the South to learn the machinist's trade. Address Trade, Care AM. MACHINIST.

Patternmakers Wanted — None but first-class workmen need apply. Deane Steam Pump Company, Holyoke, Mass.

Machinist desires position in some progressive or wide-awake toolroom.; correspondence solicited. Address Box 379, Waynesboro, Franklin Co, Pa.

Mechanical engineer and draftsman of experience in designing and constructing engines and machinery, wants engagement. Address Box 387, Hartford, Conn.

Position wanted by young man, mechanical draftsman, familiar with routine office work of machine shops and manufactories. G. M., AM. MACHINIST.

Wanted—Immediately, a good iron melter; will be required to fix his own furnace; none but steady man desired. Address, stating wages, J. & Son, Box 355, Sherbrooke, Canada.

Wanted—By practical mechanic, designer and draftsman, position as supt. or foreman of machine works; have had large experience handling men and systematizing work; best references given; c'rresp'ce solicited. Address Box 486, Waterbury, Ct.

MISCELLANEOUS WANTS

Advertisements will be inserted under this head at 35 cents per line, each insertion.

The Crescent Steel Tube Scraper is king. Crescent Mfg. Co., Cleveland, Ohio.

One 20×48 Corliss engine, in good order, for sale by Henry I. Snell, 135 N. 3d st., Philadelphia, Pa.

If you want engines, boilers, or machinery of any kind, send your address to Henry I. Snell, 135 N. 3d st., Philadelphia, Pa.

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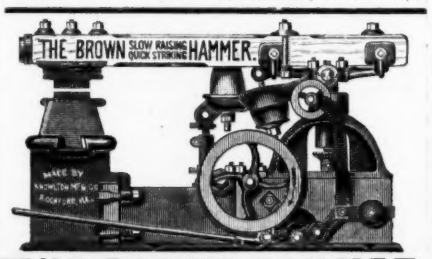

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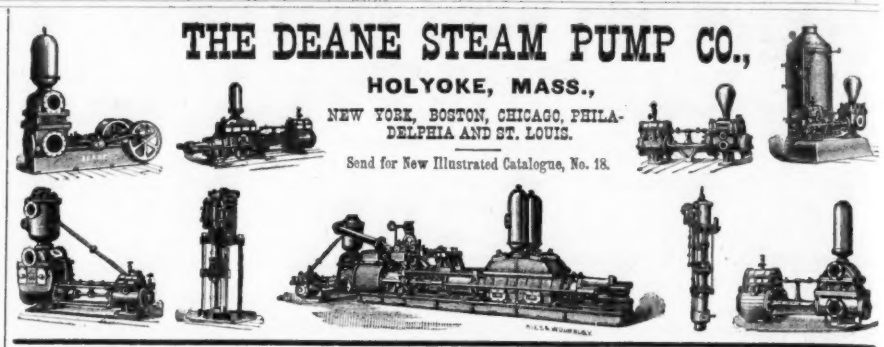

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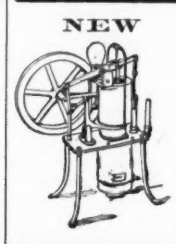

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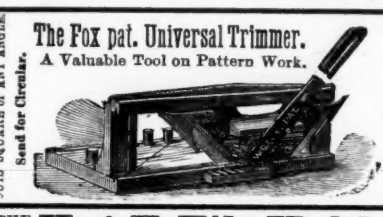

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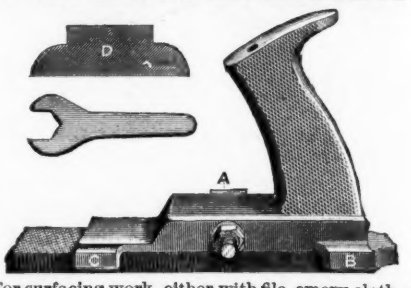

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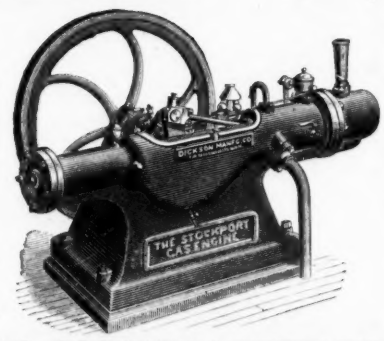

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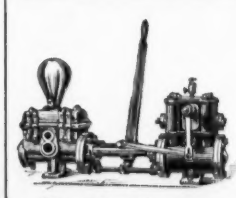

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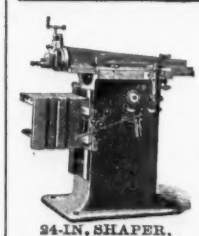

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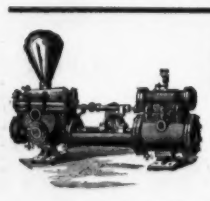

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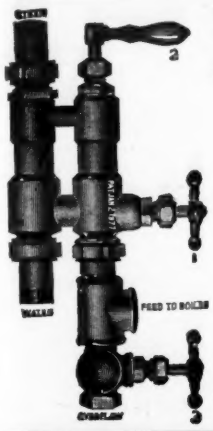

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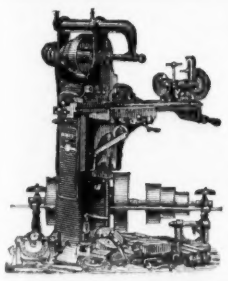

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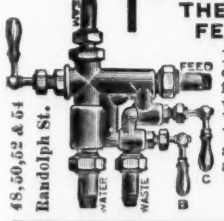

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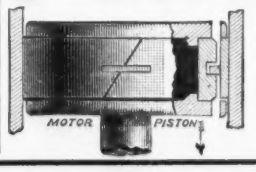

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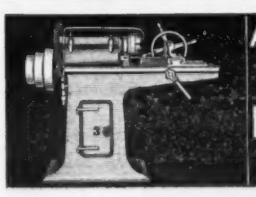

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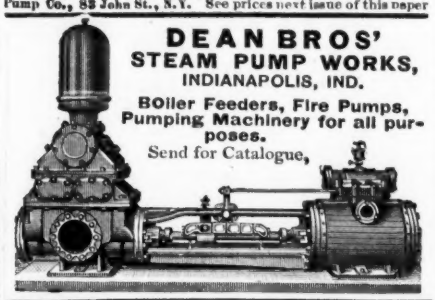

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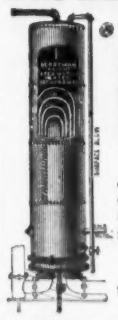

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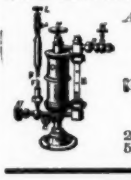

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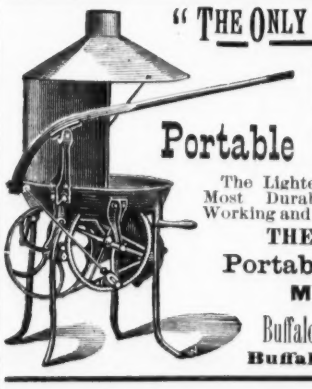

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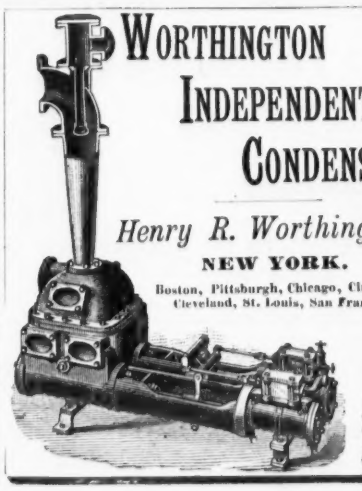

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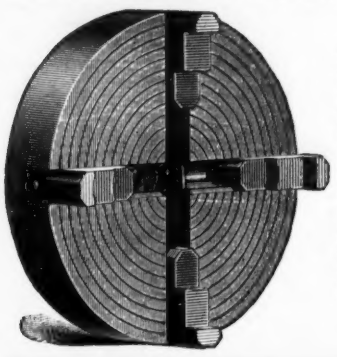

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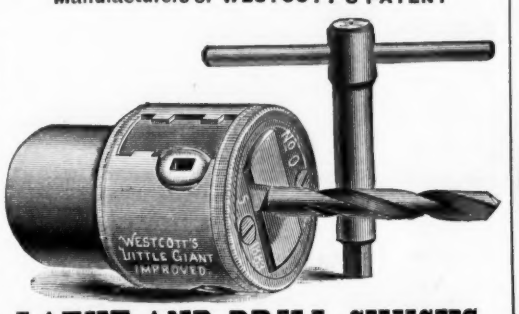

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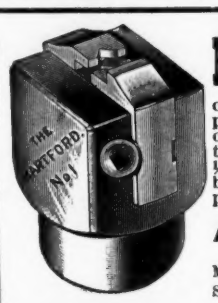

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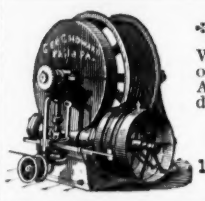

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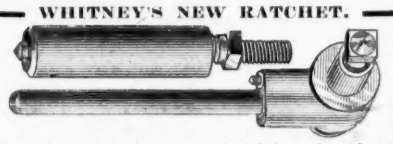

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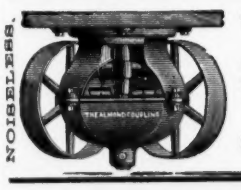

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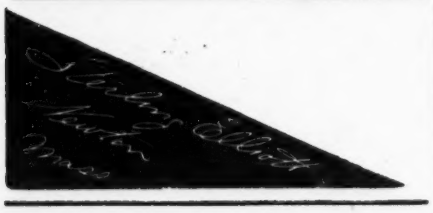

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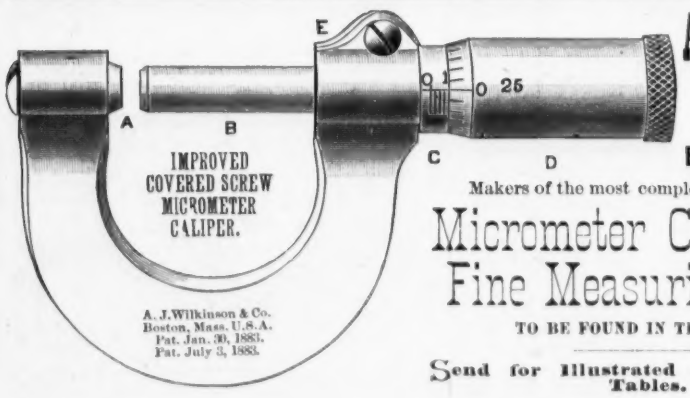

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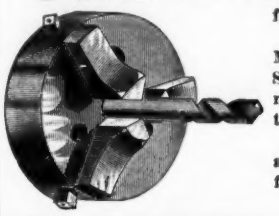

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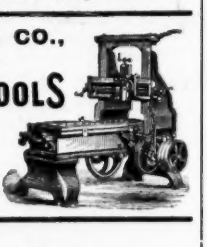

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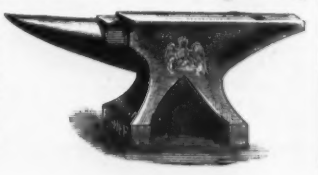

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Below will be found references to a small portion of the practical articles that have been specially prepared for the American Machinist, and have appeared in our columns during the last few months. No other mechanical journal in this country has or ever has had such a collection of practical articles, by writers of well known ability, as are presented in these columns week by week. Every issue gives information that is taken up and applied in the shops and factories in various parts of the country. Copies containing these articles can be readily obtained by ordering of any newsdealer, or by writing to this office, at 5 cents per copy.

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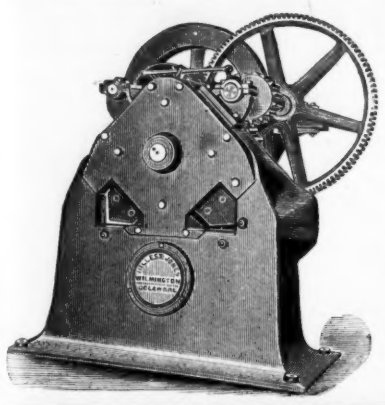

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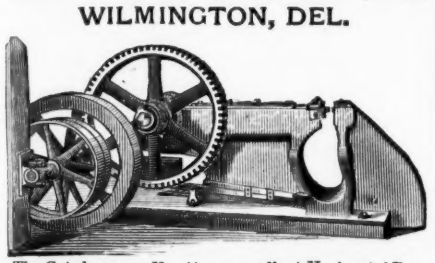

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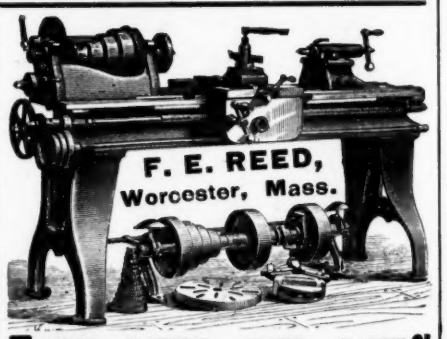

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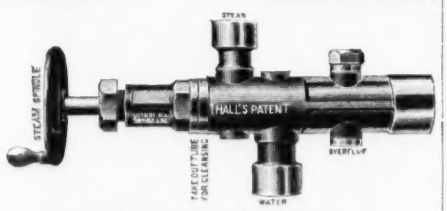

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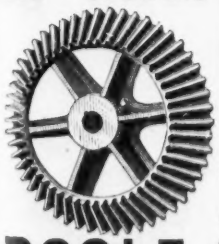

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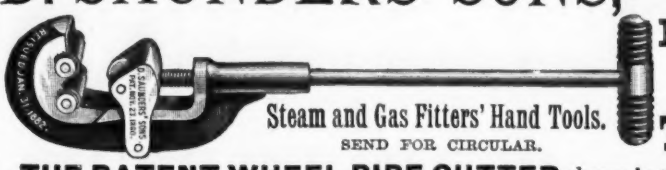

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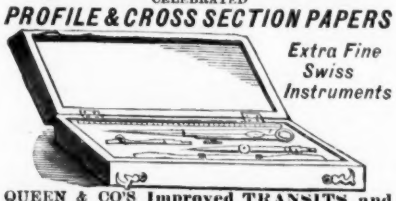

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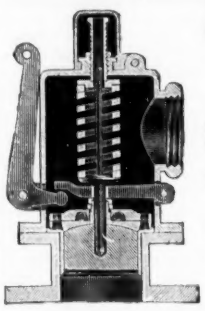

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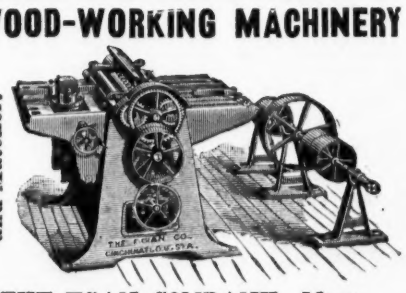

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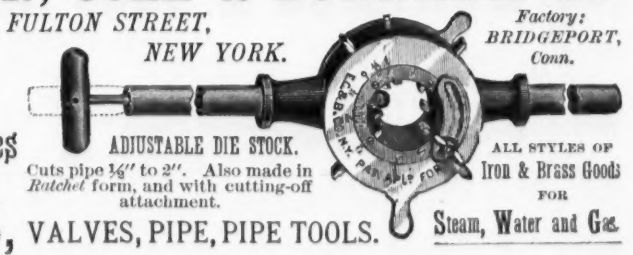

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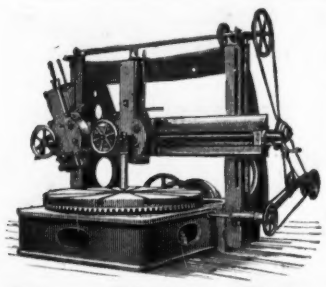

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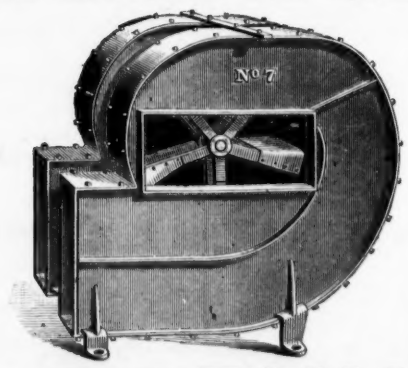

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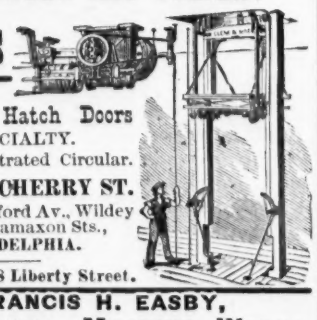

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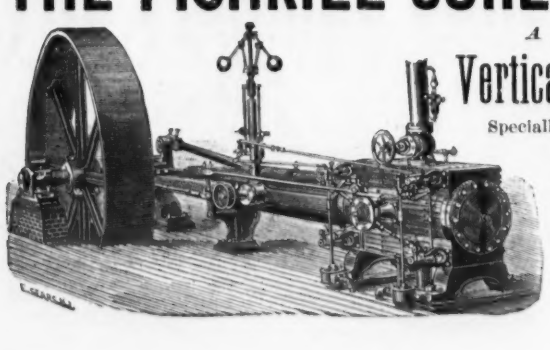

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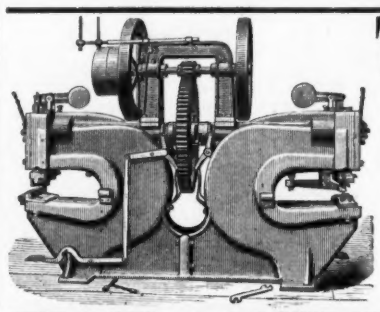

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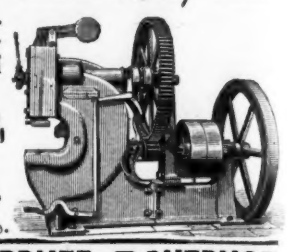

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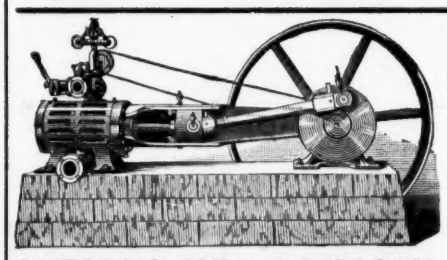

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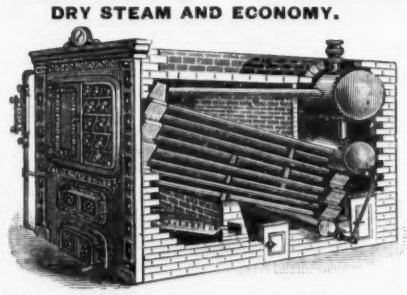

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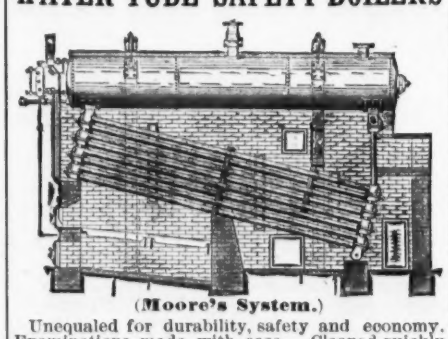

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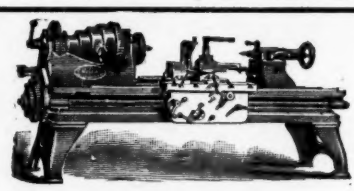

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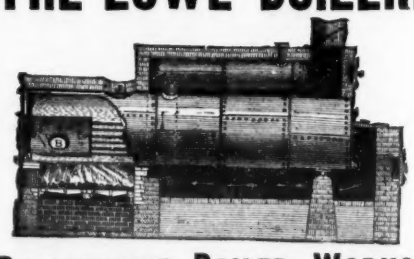

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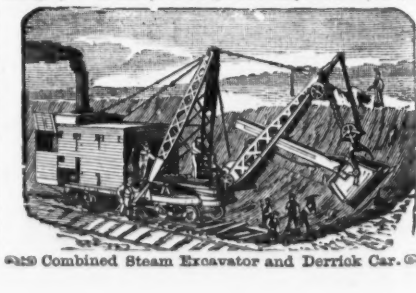

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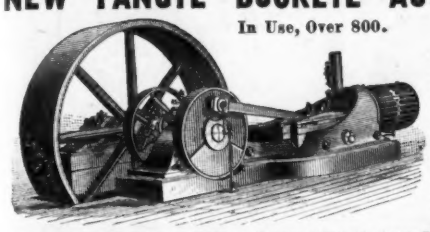

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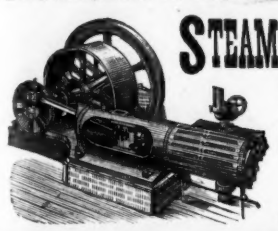

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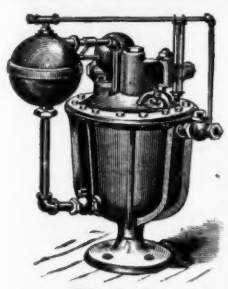

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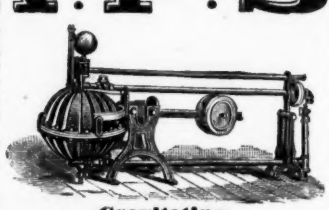

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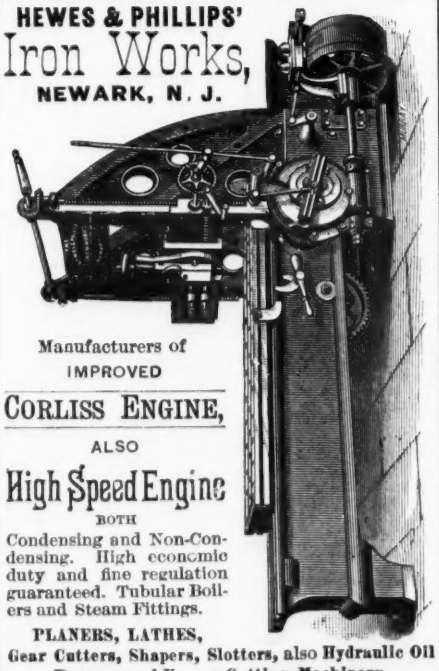

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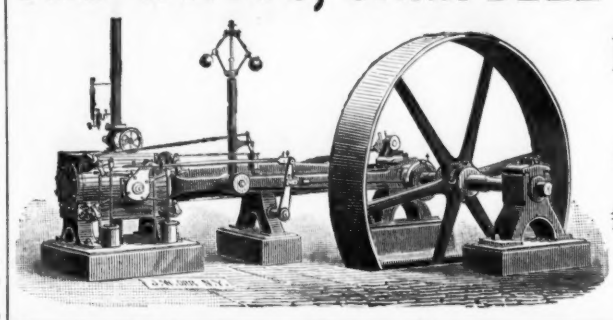

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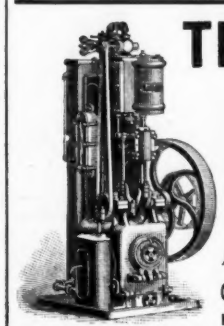

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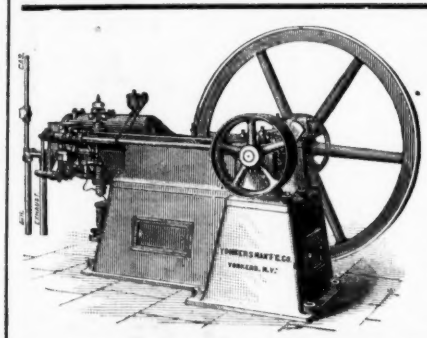

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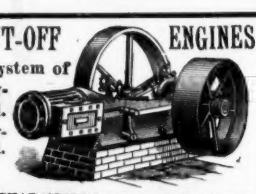

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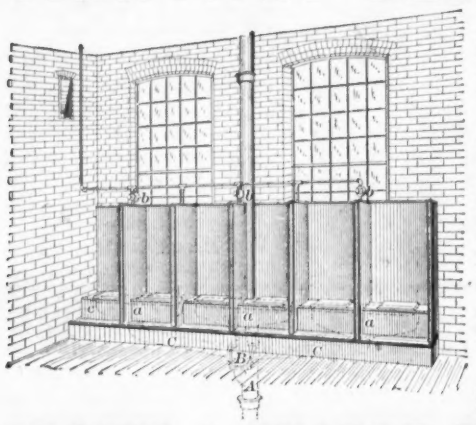

The accompanying cut shows an arrangement for closets in use at our works for several years and which has given universal satisfaction. The latrines, *a*, one of which answers for two closets, are filled to within a few inches of the top with water, an overflow in a valve in the center of each preventing their being filled too full. The water is let into the latrines through a pipe which extends around the inside of the same, and the pipe, being perforated on the under side, washes the sides. These latrines are emptied once or twice each day by raising the valve by the rod *b*, allowing the contents to escape through a soil pipe. The closets should be ventilated under the seats into the chimney where possible, as shown by an opening at *c*. Special pipes, connecting with upright soil pipe, are shown at *A*, *B*, and *C*.

We are now prepared to furnish castings, either rough or fitted complete for these closets, with drawings showing construction of wood work, etc.

ILLUSTRATED AND DESCRIPTIVE CIRCULAR, WITH PRICES, MAILED ON APPLICATION.

BROWN & SHARPE MFG. CO., PROVIDENCE, RHODE ISLAND.

MACHINE TOOLS
—AND—
IRON-WORKING MACHINERY
OF EVERY DESCRIPTION.

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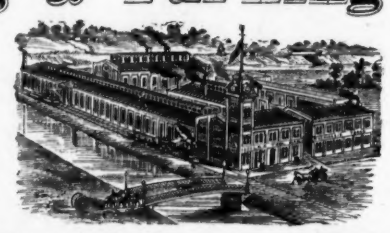

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ENGINE LATHES,
Upright Drill Presses
SPECIAL PULLEY TURNING LATHES.
Special Pulley Boring Machines, &c., &c.

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HAMILTON, OHIO.
PHILADELPHIA, 713 Chestnut Street. *CHICAGO, Gaff B'd'g, La Salle St.*

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JIB CRANES
OF ANY CAPACITY. FOR HAND OR POWER.

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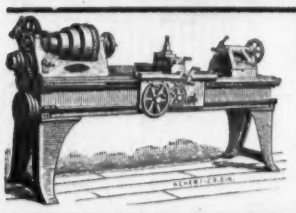
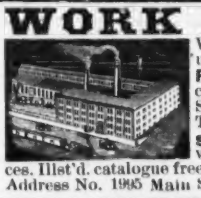


17 in. x 6 ft.
$200.
G.A. Gray, Jr. & Co.
CINCINNATI, O.

WORK SHOPS



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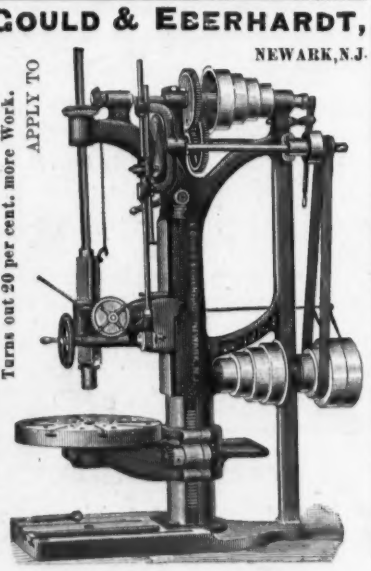

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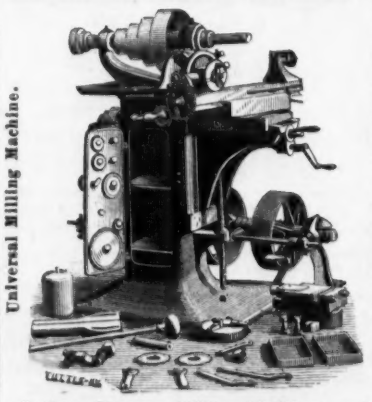

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MANUFACTURE
PLANERS
to plane 16 in. x 16 in. x 3 ft., to 60 in. x 60 in. x 20 ft., with quick return motion.
PILLAR SHAPERS
with 6 in. x 10 in. stroke.

Shaping Machines
with 12 in. and 14 in. stroke, all feeds automatic.
KEY-SEAT Cutting Machines,
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Price List furnished on Application.

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MANUFACTURERS OF
STANDARD MACHINE WRENCHES
DROP FORGED OF
BAR STEEL
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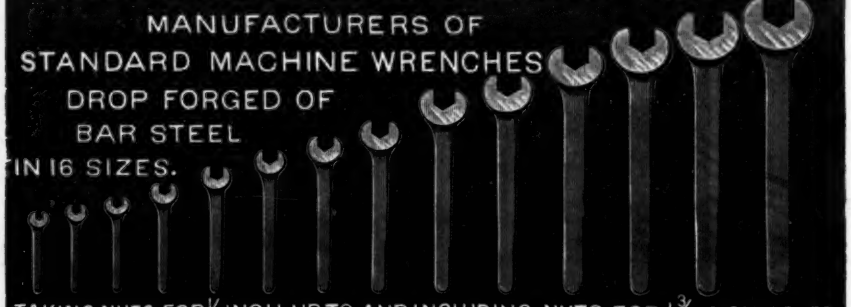

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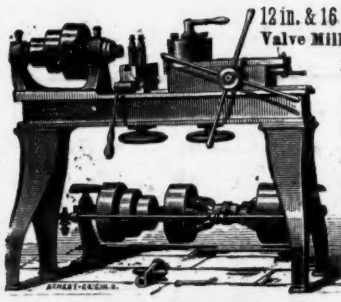

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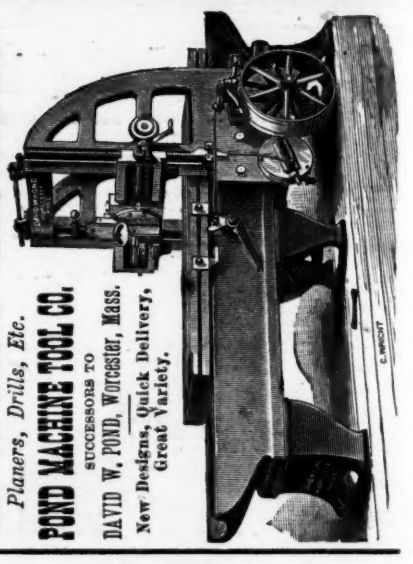

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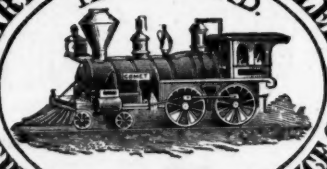

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PRATT & LETCHWORTH Proprietors.

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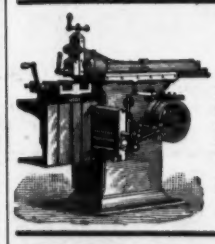

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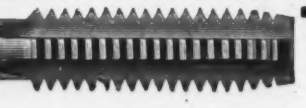

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